**UNIT I**

**GROUPS AND RINGS**

**PART-A**

**1.** State any two properties of a group.

**2.** Define Homomorphism of groups.

3. Give an example of Homomorphism of groups.

4. Define Isomorphism.

5. Give any two Example of Isomorphism.

6. Show that ( $Z_{5,}, +_5$ ) is a cyclic group.

7. Prove that the group $H = (Z_4, +)$ is cyclic.

8. Prove that $U_9 = \{1,2,4,5,7,8\}$ is cyclic group.

9. Define Left coset and Right coset of the group.

10. Consider the group $Z_4$= {[0],[1],[2],[3]} of integers modulo 4. Let H={[0],[2]} be a subgroup of $Z_4$ under $+_4$. Find the left cosets of H.

11. State Lagrange's theorem for finite groups. Is the converse true?

12. Define ring and give an example of a ring with zero-divisors.

13. Define unit and multiplicative inverse of a Ring.

14. Define integral domain and give an example.

15. Define Field and give an example.

16. Give an example of a ring which is not a field.

17. Define Integer modulo n.

18. Determine the values of the integer n>1 for the given congruence $401 \equiv 323 (\text{mod } n)$ is true.

19. Determine the values of the integer n>1 for the given congruence $57 \equiv 1 (\text{mod } n)$ is true.

20. Determine the values of the integer n>1 for the given congruence $68 \equiv 37 (\text{mod } n)$is true.

21. Determine the values of the integer n>1 for the given congruence $49 \equiv 1 (\text{mod } n)$is true.

22. Find all subrings of $Z_{24.}$

23. Define Ring homomorphism.

24. Define Ring isomorphism.

25. State Chinese Remainder Theorem.

**PART-B**

1. (a) Let $(G,o),(H,*)$ be groups with respective identities $e_G, e_H$. If $f: G \to H$ is a homomorphism, then

a) $f(e_G) = e_H$ b) $f(a^{-1}) = [f(a)]^{-1}$ for all $a \in G$.

c) $f(a^n) = [f(a)]^n$ for all $a \in G$ and all $n \in Z$

d) $f(S)$ is a subgroup of H for each subgroup S of G. **(8)**

(b) Let $a \in G$ with O(a)=n. if $k \in Z$ and $a^k = e$, then $n/k$. **(8)**

2. State and prove the fundamental theorem of group homomorphism's. **(16)**

3. (a) Let $G$ be a cyclic group. **(8)**

a) If $|G|$ is infinite, then $G$ is isomorphic to $(Z,+)$.

b) If $|G|$ =n, where $n$>1, then $G$ is isomorphic to $(Z_n,+)$.

(b) Every subgroup of a cyclic group is cyclic **(8)**

4. Show that $(M,\bullet)$ is an abelian group where $M = \{A, A^2, A^3, A^4\}$ with $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $\bullet$ is ordinary matrix multiplication. Further prove that $(M,\bullet)$ is isomorphic to the abelian group $(G,\bullet)$ where $G = \{1,-1,i,-i\}$ and $\bullet$ is ordinary multiplication. **(16)**

5. (a) Find the left cosets of the subgroup $H = \{[0],[3]\}$ of the group $(Z_6,+_6)$ **(8)**

(b) Show that H = { [0],[4],[8] } is a subgroup of $(Z_{12},+_{12})$. Also find the left Cosets of H in $(Z_{12},+_{12})$. **(8)**

6. State and prove Lagrange's theorem for finite group. **(16)**

7. (a) For $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 2 & 3 \end{pmatrix}$ find the subgroup $k = \langle \beta \rangle$. **(8)**

(b) Determine the left cosets of $k$ in $G = S_4$. **(8)**

8. (a) Let R be a ring with unity u. Prove that the units of R form a group under the multiplication of

the ring. **(8)**

(b) Determine whether $(z,\oplus,\circ)$ is a ring with the binary operations

$x \oplus y = x + y - 7, x \circ y = x + y - 3xy$ for all $x, y \in Z$. **(8)**

9. (a) For any ring $(R,+,\bullet)$ and any $a \in R$, we have $az = za = a$ **(8)**

(b) Given a ring $(R,+,\bullet)$, for all $a,b \in R$, **(8)**

a) –(-a)=a,

b) a(-b)=(-a)b=-(ab), and

c) (-a)(-b)=ab.

10. For a ring $(R,+,\bullet)$ **(16)**

a) if R has a unity, then it is unique, and

b) if R has a unity, and x is a unit of R, then the multiplicative inverse of $x$ is unique.

11. Let $(R,+,\bullet)$ be a commutative ring with unity. Then R is an integral domain if and only if, for all

$a,b,c \in R$, where $a \neq z, ab = ac \Rightarrow b = c.$ **(16)**

12. (a) Show that $(Z,+,\times).$ is an integral domain where Z is the set of all integers. **(8)**

(b) If $(F,+,\bullet)$ is a field, then it is an integral domain. **(8)**

13. Given a ring $(R,+,\bullet)$ ,a nonempty subset *S* of *R* is a subring of *R* if and only if **(16)**

a) for all $a,b \in S$, we have $a+b, ab \in S$,

b) for all $a,b \in S$, we have $-a \in S.$

14. Let consider the ring $R = M_2(Z)$ and the subset $S = \left\{ \begin{bmatrix} x & x+y \\ x+y & x \end{bmatrix}; x, y \in Z \right\}$ of $R.$ Prove that S is subring of R. **(16)**

15. Let $A = \left\{ \begin{bmatrix} a & 0 \\ b & c \end{bmatrix}; a,b,c \in Z \right\}$ be the subset of the ring $R = M_2(z).$ Prove that A is a subring **(16)**

16. (a) For $n \in Z^+, n > 1,$ under the closed binary operations defined above, Prove that $Z_n$ is a

commutative ring with unity. **(8)**

(b) Prove that $Z_n$ is a field if and only if n is a prime. **(8)**

17. (a) In $Z_n$, prove that [a] is a unit if and only if gcd(a,n)=1. **(8)**

(b) Find $[25]^{-1}$ in $Z_{72}$. **(8)**

18. Let $f:(R,+,\bullet)\to(S,\oplus,\otimes)$ is a ring homomorphism, then **(16)**

a) $f(Z_R)=Z_S$, where $Z_R, Z_S$ are the zero elements of R and S, respectively;
b) $f(-a)=-[f(a)]$, for all $a\in R$;
c) $f(na)=nf(a)$, for all $a\in R, n\in Z$;
d) $f(a^n)=[f(a)]^n$, for all $a\in R, n\in Z^+$; and
e) If A is a subring of R, it follows that f(A) is a subring of S.

19. State and prove The Chinese Remainder Theorem. **(16)**

20. Let $A=\left\{\begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}; a\in R\right\}$ **(16)**

a) show that *A* is a ring under matrix addition and multiplication

b) Prove that *R* is isomorphic to *A.*

**UNIT II**

## FINITE FIELDS AND POLYNOMIALS

### PART-A

1. Define ring.

2. Define polynomial.

3. Define Field.

4. What is meant by a finite field.

5. What is meant by polynomial ring.

6. Define root of the polynomial.

7. When do you you say that f(x) is a divisor of g(x)?

8. Find the roots of $f(x)=x^2-2 \in Q(x)$.

9.Find all roots of $f(x)=x^2+4x$ if $f(x) \in z_{12}[x]$

10. State division algorithm

11. State the remainder theorem.

12. Determine all polynomials of degree 2 in $z_2[x]$.

13. State the factor theorem.

14. Determine polynomial h(x) of degree 5 and polynomial

k(x)of degree 2 such that degree of h(x)k(x) is 3.

15. Define reducible and irreducible polynomials .

16. Give example for reducible and irreducible polynomials.

17. Verify the polynomial $x^2+x+1$ over $Z_3$,$Z_7$ irreducible or not

18. What is meant by monic polynomial?

19. When do you say that 2 polynomials are relatively prime?

20. What is the characteristic of R?

21. Find the characteristic of the following rings a) $(Z_3,+,.)$ b)$(Z_4,+,.)$ and $Z_3[x]$.

22. Give an example of a polynomial $f(x) \in R(x)$ where f(x) has degree 8, is reducible but has

no real roots.

23. Write f(x)= $(2x^2+1)(5x^3-5x+3)(4x-3) \in z_7[x]$ as the product of unit and three monic polynomials.

24. If f(x) and g(x) are relatively prime and $\in F(x)$ where F is any field , show that there is no element a $\in F$ such that f(a)=0 and g(a)=0

25. Define congruence modulo m.

## PART B

1. (a)Show that (R,+,.) is a ring **(8)**

   (b)Show that R[x] is a polynomial ring over R. **(8)**

2. (a)If R is an integral domain ,prove that f(x) is an unit in R[x], then prove that f(x) is constant and is unit in R **(8)**

   (b)If R[x] is a polynomial ring then show that it is commutative. **(8)**

3. (a)Prove that every field is an integral domain. **(8)**

   (b)Let (R,+,.) be a commutative ring with unity u .Show that R is an integral domain if and only if for all f(x),g(x) $\in R(x)$, if neither f(x) nor g(x) is the zero polynomial , then degree f(x) g(x)=degree f(x)+degree g(x) **(8)**

4. (a)Find all the irreducible polynomials in $Z_2$[x] **(8)**

   (b)Find all the roots of f(x)=$x^2$+3x+2 $\in Z_6[x]$ **(8)**

5. State and prove Division algorithm **(16)**

6. (a)State and prove remainder and factor theorem **(8)**

   (b) Discuss irreducible and reducible polynomials with example over R[x],Q[x],C[x]. **(8)**

7. (a)Find the remainder when f(x) is divisible by g(x)

   f(x),g(x) $\in Q(x)$, $f(x)=x^8+7x^5-4x^4+3x^3+5x^2-4$ , $g(x)=x-1$ **(8)**

   (b) f(x),g(x) $\in Z_{11}(x)$, $f(x)=3x^5-8x^4+3x^3-x^2+4x-7$ , $g(x)=x+9$ **(8)**

8. (a)If f(x) $\in F(x)$ has degree n $\geq 1$, then prove that f(x) has atmost n roots. **(8)**

(b)If g(x)= $x^5 - 2x^2 + 5x - 3$ *and* $f(x) = x^4 - 5x^3 + 7x$, determine q(x) and r(x) such that

g(x)=q(x)f(x)+r(x) **(8)**

9. (a)If f(x)=$x^4$-16, find its roots and factorization in Q(x). **(8)**

(b)Determine all the polynomials of degree 2 in $Z_7$[x]. **(8)**

10.(a)Find all the roots of f(x)=$x^2$+4x if f(x) =$Z_{12}$[x] **(8)**

(b)Show that for all f(x) $\in F(x)$, every nonzero polynomial of degree $\leq 1$ is irreducible. **(8)**

11. (a)Let (F,+,.) be a field . If char(F)>0, then show that char(F) must be finite. **(8)**

(b) Prove that the characteristic of a field is either 0 or a prime number **(8)**

12. (a)Prove that the polynomial f (x) = $x^4 + 2x^6 \in Z_3$[x] is of degree 6 is reducible . **(8)**

(b)Show that a finite field has order $p^t$, where p is a prime and t$\in Z^+$ **(8)**

13. (a)Construct a finite field of 25 elements. **(8)**

(b)Give characteristic for the following rings **(8)**

(a)$Z_{11}$ (b)$Z_{11}$[x] (c)Q[x]

14. (a)Find the roots of f(x)= $= x^2 + 3x + 2 \in Z_6[x]$ **(8)**

(b)State and prove Euclidean algorithm. **(8)**

15. (a)Show that g(x)=q(x)f(x)+r(x), if g(x) =$x^4$+2$x^3$+x+4, f(x)=$x^2$+3x+1 **(8)**

(b) Show that $Z_m$ is a field if and only if m is a prime. **(8)**

## UNIT-III

## DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS

### PART-A

1. Write about divisible.
2. Define division algorithm.
3. Define greatest common divisor of b.
4. Define Euclidean algorithm.
5. Solve by Euclidean algorithm for b=288 and c=158.
6. Define least common multiple.
7. Define prime number.
8. Define Composite number with example.
9. State the binomial theorem.
10. Define arithmetical function with example.
11. Prove that if n is an even number, then $3^n+1$ is divisible by 2; if n is an odd number, k then $3^n+1$ is divisible by $2^2$; if n is any number, whether even or odd, then $3^n+1$ is not divisible by $2^m$ with $m \geq 3$.
12. Show that if $1<a_1<a_2....<a_{n-1}<a_n$, then there exist i and j with i<j, such that $a_i/a_j$.
13. Define square number with example.
14. Find the greatest common divisor of 525 and 231.
15. Find GCD(136,221,391).

### PART-B

1. (a) State and prove division algorithm. **(8)**

   (b) If g is the greatest common divisor of b and c, then prove that there exist integers x0 and y0 such that g=(b,c)=bx0+cy0. **(8)**

2. (a) If c\ab and (b,c)=1, then prove that c\a. **(8)**

   (b) State and prove Euclidean algorithm. **(8)**

3. (a) Find the greatest common divisor of 42823 and 6409. **(8)**

   (b) Find integers x and y to satisfy 42823x + 6409y=17. **(8)**

4. (a) Find g=(b,c) where b=5033464705 and c=3137640337, and determine x and y such that bx + cy = g. **(8)**

   (b) Find the least common multiple of (i)482 and 1687, (ii)60 and 61. **(8)**

5. (a) How may integers between 100 and 1000 are divisible by 7? **(8)**

   (b) Prove that the product of three consecutive integers is divisible by 6 of four consecutive

integers by 24. **(8)**

6. (a) Show that if k is any positive integer, then $k^2+k+1$. **(8)**

(b) Let a>1, and m, n be positive integers. Prove that $(a^m-1,a^n-1)=a^{(m,n)}-1$ **(8)**

7. (a) If m is a composite integer prove that the following integer is so too: $n_m$=11……11(m times).

**(8)**

(b) If p is prime, propve that there exist no positive integers a and b such that $a^2=pb^2$. **(8)**

8. (a) If an integer a is greater than 2 , prove that $S(a)<a\sqrt{(a)}$ **(8)**

(b) Prove that if $3/(a^2+b^2)$, then 3/a and 3/b. **(8)**

9. (a) Find the smallest positive integer having only 10 positive divisors. **(8)**

(b) Find the smallest positive integer if the sum of all its divisors is 15. **(8)**

10. (a) Find all the integers n such that P(n)=64. **(8)**

(b) Prove that there are infinitely many primes of the form 3n+2. **(8)**

11. (a) Find positive integers a and b satisfying the equations (a,b)=10 and [a,b]=100

simultaneously. Find all solutions. **(8)**

(b) Prove that (a, b)=a, b, a+b) and more generally that (a, b)=(a, b, ax+by) for all integers x, y. **(8)**

12. (a) Prove that (a, a+k)/k for all integers a, k not both zero **(8)**

(b) Prove that (a, a+2) =1 or 2 for every integer a. **(8)**

13. (a) Prove that an integer is divisible by 3 if and only if the sum of it digits is divisible by 3. Prove that an integer is divisible by 9 if and only if the sum of its digits is divisible by 9. **(8)**

(b) Prove that an integer is divisible by 11 if and only if the difference between the sum of the digits in the odd places and the sum of the digits in the even places is divisible by 11 **(8)**

14. (a) Prove that any prime of the form 3k+1 is of the form 6k+1. **(8)**

(b) If x and y are odd, prove that $x^2+y^2$ cannot be a perfect square. **(8)**

15. (a) If x and y are prime to 3, prove that $x^2+y^2$ cannot be a perfect square. **(8)**

(b) Show that n/(n-1)! For all composite n>4. **(8)**

## UNIT IV

## DIOPHANTINE QUATIONS AND CONGRUENCES

### PART A

1. Define linear Diophantine equation.
2. State about the solution of linear Diophantine equation.
3. Write the solution of ax + by =c.
4. Define unimodular with example.
5. Define Pythagorean triangle.
6. Write the legs of the Pythagorean triangles.
7. Define congruent and not congruent.
8. Define residue.
9. Define complete residue
10. State Chinese Remainder Theorem.
11. Define n-th power residue modulo p.
12. Define Euler's criterion.

### PART-B

1. (a) Find all solutions of $10x - 7y = 17$. **(8)**

   (b) Prove that $101x+37y=3819$ has a positive solution in integers. **(8)**

2. (a) Find all solution in integers of $2x+3y+4z=5$. **(8)**

   (b) Find all solution in integers of the simultaneous equations. $20x+44y+50z=10$.

   $17x+13y+11z=19$. **(8)**

3. (a) Find all solutions of the simultaneous congruence's $3x+z \equiv 1 (\mathrm{mod}(5), 4x-y+z \equiv 3 (\mathrm{mod} 5)$ **(8)**

   (b) For what integers a, b, and c does the system of equations $x+2y+3z+4w=a$. $x+4y+9z+16w=b$.

   $x+8y+27z+64w=c$.have a solution in integers? What are the solutions if $a=b=c=1$? **(8)**

4. (a) The equation $15x^2-7y^2=9$ has no solution in integers. **(8)**

   (b) let f denote a polynomial with integral coefficients. If a $a \equiv b (\mathrm{mod}\ m)$ then $f(a) \equiv f(b) \mathrm{mod}\ m$ **(8)**

5. If $x \equiv y (\mathrm{mod}\ m)$ , then y is called a residue of x modulo m, a set $x_1, x_2, \ldots x_n$. is called a complete residue system modulo m if for every integer there is one and only one $x_j$ such that $y \equiv x_j (\mathrm{mod}\ m)$ **(16)**

6. (a) If p is a prime number and $p \equiv 1 (\mathrm{mod}\ 4)$ then there exist positive integer a and b such that $a^2+b^2=p$. **(8)**

   (b) Let q be a prime factor of $a^2+b^2$. If $q \equiv 3 (\mathrm{mod}\ 4)$ then $q \mid a$ and $q \mid b$. **(8)**

7. (a) Find the least positive integer x such that $x \equiv 5 (\mathrm{mod}\ 7)$. $x \equiv 7 (\mathrm{mod}) 11$, and $x \equiv 3 (\mathrm{mod}) 13$ **(8)**

   (b) Show that there is no x for which both $x \equiv 29 (\mathrm{mod}\ 52)$ and $x \equiv 19 (\mathrm{mod}\ 72)$. **(8)**

8. (a) Determine whether the system $x \equiv 3(\text{mod } 10), x \equiv 8(\text{mod } 15), x \equiv 5(\text{mod } 84)$ has no solution, and find them all, if any exist. **(8)**

(b) Exhibit the foregoing one to one correspondence explicitly, when $m_1=7$, $m_2=9$, $m=63$. **(8)**

9. (a) Let $f(x) = x^2+x+7$. Find all roots of congruence $f(x) \equiv 0(\text{mod } 15)$ **(8)**

(b) Solve the set of congruence's: $x \equiv 1(\text{mod } 4), x \equiv 0(\text{mod } 3), x \equiv 5(\text{mod } 7)$ **(8)**

10. (a)Find all the integers that satisfy simultaneously: $x \equiv 2(\text{mod } 3), x \equiv 3(\text{mod } 5), x \equiv 1(\text{mod } 7)$ **(8)**

(b)Find all the integers that give the remainders 1,2,3 when divided by 3,4,5 respectively. **(8)**

11. (a)Find the number of positive integers≤7200 that are prime to 3600. **(8)**

(b)Solve the congruence $x^3+4x+8 \equiv 0 \pmod{15}$ **(8)**

12. (a)Solve the congruence $x^3-9x^2+23x-15 \equiv 0 \pmod{503}$ **(8)**

(b)For any integer x, (a,b)=(b,a)=(a,-b)=(a,b+ax) **(8)**

13. (a)If (a,m)=(b,m)=1, then (ab,m)=1. **(8)**

(b)If $b \equiv c(\text{mod } m)$, then $(b, m) = (c, m)$ **(8)**

# Computer Networks QB

**Important Short Questions and Answers: Computer Networks - Physical Layer**

### 1. What is mean by data communication?

Data communication is the exchange of data (in the form of 1s and 0s) between two devices via some form of transmission medium (such as a wire cable).

### 2. What are the three criteria necessary for an effective and efficient network?

The most important criteria are performance, reliability and security.

**Performance** of the network depends on number of users, type of transmission medium, and the capabilities of the connected h/w and the efficiency of the s/w.

**Reliability** is measured by frequency of failure, the time it takes a link to recover from the failure and the network's robustness in a catastrophe.

**Security** issues include protecting data from unauthorized access and viruses.

### 3. What are the three fundamental characteristics determine the effectiveness of the data communication system?

Delivery: The system must deliver data to the correct destination.

Accuracy: The system must deliver data accurately.

Timeliness: The system must deliver data in a timely manner.

### 4. What are the advantages of distributed processing?

An advantage of distributed processing includes security/encapsulation, distributed databases, faster problem solving, security through redundancy and collaborative processing.

### 5. Why are protocols needed?

In networks, communication occurs between the entities in different systems. Two entities cannot just send bit streams to each other and expect to be understood. For communication, the entities must agree on a protocol. A protocol is a set of rules that govern data communication.

### 6. Why are standards needed?

Co-ordination across the nodes of a network is necessary for an efficient communication. If there are no standards, difficulties arise. A standard provides a model or basis for development to which everyone has agreed.

### 7. For n devices in a network, what is the number of cable links required for a mesh and ring topology?

Mesh topology – n (n-1)/2.

Ring topology – n

## 8. What is the difference between a passive and an active hub?

An active hub contains a repeater that regenerates the received bit patterns before sending them out. A passive hub provides a simple physical connection between the attached devices.

## 9. Distinguish between peer-to-peer relationship and a primary-secondary relationship. Peer-to-peer relationship:

All the devices share the link equally.

## Primary-secondary relationship:

One device controls traffic and the others must transmit through it

## 10. Assume 6 devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device?

Number of cables=n (n-1)/2=6(6-1)/2=15

Number of ports per device=n-1=6-1=5

## 11. Group the OSI layers by function.

The seven layers of the OSI model belonging to three subgroups. Physical, data link and network layers are the network support layers; they deal with the physical aspects of moving data from one device to another. Session, presentation and application layers are the user support layers; they allow interoperability among unrelated software systems. The transport layer ensures end-to-end reliable data transmission.

## 12. What are header and trailers and how do they get added and removed?

Each layer in the sending machine adds its own information to the message it receives from the layer just above it and passes the whole package to the layer just below it. This information is added in the form of headers or trailers. Headers are added to the message at the layers 6,5,4,3, and 2. A trailer is added at layer2. At the receiving machine, the headers or trailers attached to the data unit at the corresponding sending layers are removed, and actions appropriate to that layer are taken.

## 13. Discuss the mode for propagating light along optical channels.

There are two modes for propagating light along optical channels, multimode and single mode.

**Multimode:** Multiple beams from a light source move through the core in different paths.

**Single mode:** Fiber with extremely small diameter that limits beams to a few angles, resulting inan almost horizontal beam.

## 14. How are the guided media differing from unguided transmission media? Guided transmission media

1. Guided indicate, medium is contained have any within physical boundary

2. Transmission takes place through wire.

## Unguided transmission media

1. Unguided medium does not Physical boundary

2. It is a wireless transmission.

## 15. What are the disadvantages of optical fiber as a transmission medium?

The disadvantages of optical fiber are

- Very expensive.
- Installation and maintenance is difficult.
- Fragility.

## 16. What are the criteria used to evaluate transmission medium?

The criteria used to evaluate transmission medium are

- Throughput
- Propagation speed
- Propagation time
- Wavelength

## 17. Give the relationship between propagation speed and propagation time?

Propagation time = distance / propagation speed

The time required for a signal or a bit to travel from one point to another is called **Propagation time. Propagation speed** is the distance, a signal or a bit travel through a mediumin one second.

## 18. Explain cross talk and what is needed to reduce it?

Effect of one wire on another is called as cross talk. One wire will be the sending antenna and the other wire will be the receiving antenna. We can use the shielded twisted pair cable or coaxial cable for transmission, which contains metal foil to reduce cross talk.

| Virtual Circuit | Datagram Networks |
|---|---|
| A Virtual network is a cross between a circuit-switched network and a datagram network | In a datagram network, each packet is independently of all others. Even if a packet is part of a multipacket transmission, the network treats it as though it existed alone. Packet in this approach is referred to as datagrams. |
| The data link layer of these technologies is well suited to the virtual-circuit technology. | Datagram switching is normally done at the network layer. |

## 19. Compare datagram networks and virtual circuit networks.

### 20. What is TCP/IP?

TCP/IP is a hierarchical protocol made up of interactive modules, each of which provides a specific functionality: however, the modules are not necessarily interdependent.

## 21. State the role of DSL.

DSL Technology supports high speed digital communication over the existing local loops.

## 22. What is the role of DSL Modem?

DSL Technology is one of the most promising for supporting high-speed digital communication over the existing local loops.

## 23. What are the features provided by layering?

Two nice features are:

- It decomposes the problem of building a network into more manageable components.
- It provides a more modular design.

## Glossary:

**ADSL Lite**: A splitterless ADSL. This technology allows an ASDL Lite modem to be pluggeddirectly into a telephone jack and connected to the computer. The splitting is done at the telephone company.

**Bandwidth:** The difference between the highest and the lowest frequencies of a compositesignal. It also measures the information-carrying capacity of a line or a network.

**Bayone-Neill-Concelman (BNC) connector:** A common coaxial cable connector.

**Bit Stuffing:** In a bit-oriented protocol, the process of adding an extra bit in the data section of aframe to prevent a sequence of bits from looking likes a flag.

**Bit-Oriented Protocol:** A protocol in which the data frame is interpreted as a sequence of bits.

**Cable Modem:** A technology in which the TV cable provides Internet access.

**Cable Modem Transmission System (CMTS):** A device installed inside the distribution hubthat receives data from the Internet and passes them to the combiner.

**Cable TV Network:** A system using coaxial or fiber optic cable that brings multiple channels of video programs into homes.

**Circuit Switching's:** switching technology that establishes an electrical connection betweenstations using a dedicated path.

**Cladding:** Glass or plastic surrounding the core of an optical fiber; the optical density of thecladding must be less than that of the core.

**Coaxial Cable**: A transmission medium consisting of a conducting core, insulating material, anda second conducting sheath.

**Community Antenna TV (CATV):** A cable network service that broadcasts video signals tolocations with poor or no reception.

**Constellation Diagram**: A graphical representation of the phase and amplitude of different bitcombinations in digital-to-analog modulation.

**Datagram Network:** A packet-switched network in which packets are independent from eachother.

**Digital Subscriber Line Access Multiplexer (DSLAM):** A telephone company site device that functions like an ADSL modem.

**Error Control**: The handling of errors in data transmission.

**Flow Control**: A technique to control the rate of flow of frames (packets or messages).

**Guided Media:** Transmission media with a physical boundary.

**Hop-To-Hop Delivery**: Transmission of frames from one node to the next.

**Internet service provider (ISP)**: Usually, a company that provides Internet services.

**Jitter**: A phenomenon in real-time traffic caused by gaps between consecutive packets at the receiver.

**Local Area Network (LAN)** A network connecting devices inside a single building or inside buildings close to each other.

**Node-To-Node Delivery**: Transfer of a data unit from one node to the next.

**Optical Fiber**: A thin thread of glass or other transparent material to carry light beams.

**Packet Switching**: Data transmission using a packet-switched network.

**Peer-To-Peer Process**: A process on a sending and a receiving machine that communicates at agiven layer.

**Physical Layer**: The first layer of the Internet model, responsible for the mechanical andelectrical specifications of the medium.

**Switch:** A device connecting multiple communication lines together.

**Topology:** The structure of a network including physical arrangement of devices.

**Wide Area Network (WAN):** A network that uses a technology that can span a largegeographical distance.

**Important Short Questions and Answers: Computer Networks - Data Link Layer**

### 1. What are the responsibilities of data link layer?

Specific responsibilities of data link layer include the following.

a) Framing

b) Physical addressing

c) Flow control

d) Error control

e) Access control

### 2. State the difference between Fast Ethernet and Gigabit Ethernet.

| Fast Ethernet (100Mbps) | Gigabit Ethernet (1Gbps) |
|---|---|
| Upgrade the data rate to 100Mbps | Upgrade the data rate to 1Gbps. |
| Make it compatible with standard Ethernet | Make it compatible with standard or Fast Ethernet. |

### 3. What is the purpose of Network Interface Card?

A NIC is a computer circuit board or card that is installed in a computer so that it can be connected to a network. NIC provides a dedicated, full time connection to the network.

### 4. What are Virtual LANs?

A VLAN acts like an ordinary LAN, but connected devices don't have to be physically connected to the same segment. VLANs are considered likely to be used with campus environment networks. Among many companies likely to provide products with VLAN support are Cisco, Bay Networks and 3Com.

### 5. What are the functions of MAC?

MAC sublayer resolves the contention for the shared media. It contains synchronization, flag, flow and error control specifications necessary to move information from one place to another, as well as the physical address of the next station to receive and route a packet.

### 6. What are the functions of LLC?

The IEEE project 802 models take the structure of an HDLC frame and divide it into 2 sets of functions. One set contains the end user portion of the HDLC frame – the logical address, control information and data. These functions are handled by the IEEE 802.2 logical link control (LLC) Protocol.

## 7. What is Ethernet?

Ethernet is a multiple access network, meaning that a set of nodes send and receive frames over a shared link.

## 8. Define Bluetooth.

Bluetooth is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers, cameras, printers, coffee maker and so on.

## 9. Why Ethernet is said to be 1-persistent protocol?

The Ethernet is said to be a 1-persistent protocol, because an adapter with a frame to send transmits with probability one, whenever a busy line goes idle.

All the nodes can distinguish between idle and a busy link and "collision detect" means that a node listens as it transmits and can therefore detect when a frame it is transmitting as interfered (collided) with a frame transmitted by another node.

## 11. Define flow control.

Flow control refers to a set of procedures used to restrict the amount of data. The sender can send before waiting for acknowledgment.

## 12. What is a buffer?

Each receiving device has a block of memory called a buffer, reserved for storing incoming data until they are processed.

## 13. Mention the categories of flow control.

There are 2 methods have been developed to control flow of data across communication links.

- Stop and wait- send one from at a time.
- Sliding window- send several frames at a time.

## 14. What is the function of stop and wait flow control?

In this method, the sender sends one frame and waits for an acknowledgement before sending.

## 15. Mention the advantage and disadvantage of stop and wait f low control.

Advantage: simplicity and Disadvantage: inefficiency.

## 16. Define ARQ.

Error control in the data link layer is based on Automatic repeat request (ARQ), which means retransmission of data in 3 cases.

1. Damaged frame
2. Lost frame

3. Lost acknowledgment.

## 17. Mention the function of go-back N-ARQ.

It is the popular mechanism for continuous transmission error control. In the method, if our frame is lost or damaged, all frames sent since the last frame acknowledged are retransmitted.

## 18. What is selective reject ARQ?

In selective reject ARQ only the specific damaged or lost frame is retransmitted. If a frame is corrupted in transit, a NAK is returned and the frame is resent out of sequence.

## 19. Define HDLC.

It is bit-oriented data link protocols designed to support both half-duplex and full duplex communication over point to point and midpoint links.

## 20. List the types of stations is HDLC.

HDLC differentiates between 3 types of stations.

a) Primary

b) Secondary

c) Combined

## 21. What are the different communication modes in HDLC?

HDLC supports 3 modes of communication between stations.

a) Normal response mode (NRM)

b) Asynchronous response mode (ARM)

c) Asynchronous balanced mode (ABM)

## 22. Mention the types of frames in HDLC.

There are 3 types of HDLC frames.

a) Information frames (I-frames)

b) Supervisory frames (S-frames)

c) Unnumbered frames (U-frames)

## 23. Give the usage of I, S, U frames.

I frames – used to transport user data and control information relating to user data.

S frames – used only to transport control information, primarily data link layer and error controls.

U frames – reserved for systems management.

## 24. Write the types of frame fields contained in HDLC.

Each frame in HDLC may contain up to 6 fields.

a) Beginning flag field

b) An address field

c) A control field

d) An information field

e) A frame check sequence (FCS) field

f) An ending flag field.

## 25. What is meant by bit stuffing?

Bit stuffing is the process of adding one extra 0 whenever there are 5 consecutive in the data so that the receiver doesn't mistake the data for a flag.

## 26. Define LAN.

A Local Area Network (LAN) is a data communication system that allows a number of independent devices to communicate directly with each other in a limited geographic area.

## 27. Mention the various architecture in a LAN.

LAN is dominated by 4 architectures.

a) Ethernet

b) Token bus

c) Token ring

d) Fiber distributed data interface (FDDI)

## 28. Define a standard 802.3

IEEE 802.3 supports a LAN standard originally developed by Xerox and later extended by a joint venture between digital equipment corporations. Intel Corporation and Xerox. This was called 'Ethernet'.

## 29. List the most command kinds of Base band 802.3 LAN.

a) 10 Base 5

b) 10 Base 2

c) 10 Base T

d) 1 Base 5

e) 100 Base T

## 30. Mention the different kinds of Ethernet networks.

a) Switched Ethernet

b) Fast Ethernet

c) Gigabit Ethernet

## 31. Describe the three HDLC station types?

The three HDLC station types are:

**Primary station:** The primary station has the complete control of the link. The Primary stationsends commands to the secondary station.

**Secondary station:** The secondary station sends responses.

**Combined station:** The combined station is one which acts either as a primary or a Secondary,depending upon the nature and direction of the transmission. Combined station sends both commands and responses.

## 32. What is piggy backing?

Piggy backing means combining data to sent and acknowledgement of the frame received in one single frame. Piggy backing can save bandwidth because the overhead from a data frame and an ACK frame can be combined in to just one frame

## 33. Name the four types of S-frames?

The four types of S-frames are

Receive ready (RR).T0 e value of the code sub field is 00

Receive not ready (RNR). The value of the code sub field is 10

Reject (REJ). The value of the code sub field is 01

Selective reject (SREJ). The value of the code sub field is 11

## 34. Name the five categories of U-frames?

The five categories of U-frames are Mode setting, unnumbered exchange, Disconnection, Initialization mode &Miscellaneous mode

## Glossary:

**Access point (AP):** A central base station in a BSS.

**Acknowledgment (ACK):** A response sent by the receiver to indicate the successful receipt ofdata.

**ALOHA:** The original random multiple access method in which a station can send a frame anytime it has one to send.

**Asynchronous Transfer Mode (ATM):** A wide area protocol featuring high data rates andequal-sized packets (cells); ATM is suitable for transferring text, audio, and video data.

**ATM LAN:** A LAN using ATM technology.

**ATM layer:** A layer in ATM that provides routing, traffic management, switching, andmultiplexing services.

**Automatic Repeat Request (ARQ):** An error-control method in which correction is made byretransmission of data.

**Auto negotiation**: A Fast Ethernet feature that allows two devices to negotiate the mode or datarate.

**Backward Explicit Congestion Notification (BECN)**:A bit in the Frame Relay packet thatnotifies the sender of congestion.

**Basic Service Set (BSS):** The building block of a wireless LAN as defined by the IEEE 802.11standard.

**Bluetooth:** A wireless LAN technology designed to connect devices of different functions suchas telephones and notebooks in a small area such as a room.

**Bursty Data**: Data with varying instantaneous transmission rates.

**Data Link Control** The responsibilities of the data link layer: flow control and error control.
**Data Link Layer** The second layer in the Internet model. It is responsible for node-to-nodedelivery.

**Encryption** Converting a message into an unintelligible form that is unreadable unlessdecrypted.

**Ethernet:** A local area network using the CSMA/CD access method.

**Extended Service Set (ESS)**: A wireless LAN service composed of two or more BSSs with Apsas defined by the IEEE 802.11 standard.

**Fast Ethernet:** Ethernet with a data rate of 100 Mbps.

**Forward Explicit Congestion Notification (FECN):** A bit in the Frame Relay packet thatnotifies the destination of congestion.

**Forwarding:** Placing the packet in its route to its destination.

**Frame Relay:** A packet-switching specification defined for the first two layers of the Internetmodel. There is no network layer. Error checking is done on end-to-end basis instead of on each link.

**Gigabit Ethernet:** Ethernet with a 1000 Mbps data rate.

**Go-Back-N ARQ:** An error-control method in which the frame in error and all following framesmust be retransmitted.

**High-level Data Link Control (HDLC):** A bit-oriented data link protocol defined by the ISO.

**Institute of Electrical and Electronics Engineers (IEEE):** A group consisting of professionalengineers which has specialized societies whose committees prepare standards in members' areas of specialty.

**Interframe space (IFS):** In wireless LANs, a time interval between two frames to control accessto the channel.

**Logical link control (LLC):** The upper sublayer of the data link layer as defined by IEEEProject 802.2.

**Medium access control (MAC) sublayer:** The lower sublayer in the data link layer defined bythe IEEE 802 project. It defines the access method and access control in different local area network protocols.

**Network Address Translation (NAT):** A technology that allows a private network to use a setof private addresses for internal communication and a set of global Internet addresses for external communication.

**Network Allocation Vector (NAV):** In*CSMA/CA,*the amount of time that must pass before astation can check for an idle line.

**Normal Response Mode (NRM):** In HDLC, a communication mode in which the secondarystation must have permission from the primary station before transmission can proceed.

**Password Authentication Protocol (PAP):** A simple two-step authentication protocol used inPPP.

**Piconet:** A Bluetooth network.

**Piggybacking:** The inclusion of acknowledgment on a data frame.

**Poll:** In the primary/secondary access method, a procedure in which the primary station asks asecondary station if it has any data to transmit.

**P-Persistent:** A CSMA persistence strategy in which a station sends with probability*p*if it findsthe line idle.

**Preamble:** The 7-byte field of an IEEE 802.3 frame consisting of alternating 1s and 0s that alertand synchronize the receiver.

**Project 802:** The project undertaken by the IEEE in an attempt to solve LAN incompatibility

**Routing Table:** A table containing information a router needs to route packets. The informationmay include the network address, the cost, the address of the next hop, and so on.

**Scatternet**:A combination of piconets.

**Select:** In the poll/select access method, a procedure in which the primary station asks asecondary station if it is ready to receive data.

**Selective-Repeat ARQ:** An error-control method in which only the frame in error is resent.

**Sliding Window:** A protocol that allows several data units to be in transition before receiving anacknowledgment.

**Sliding Window ARQ:** An error-control protocol using sliding window concept.

**Slotted ALOHA:** The modified ALOHA access method in which time is divided into slots andeach station is forced to start sending data only at the beginning of the slot.

**Standard Ethernet:** The conventional Ethernet operating at 10 Mbps.

**Stop-and-Wait Protocol:** A protocol, in which the sender sends one frame, stops until itreceives confirmation

from the receiver, and then sends the next frame.

**Switched Ethernet:** An Ethernet in which a switch, replacing the hub, can direct a transmissionto its destination.

**Throughput:** The number of bits that can pass through a point in one second.

**Unicast Address:** An address belonging to one destination.

**Virtual Circuit (VC):** A logical circuit made between the sending and receiving computer.

**Virtual Circuit Switching:** A switching technique used in switched WANs.

**Virtual Link:** An OSPF connection between two routers that is created when the physical link isbroken. The link between them uses a longer path that probably goes through several routers.

**Virtual Local Area Network (VLAN):** A technology that divides a physical LAN into virtualworkgroups through software methods.

**X.25:** An ITU-T standard that defines the interface between a data terminal device and a packet-switching network

**Important Short Questions and Answers: Computer Network Layer**

**1. What are the network support layers and the user support layers? Network support layers:**

The network support layers are Physical layer, Data link layer and Network layer. These deals with electrical specifications, physical connection, transport timing and reliability.

## User support layers:

The user support layers are: Session layer, Presentation layer, Application layer. These allow interoperability among unrelated software system.

## 2. With a neat diagram explain the relationship of IEEE Project to the OSI model?

| | |
|---|---|
| Other layers | Other layers |
| Network | Network |
| Logical Link Control | Data link |
| Media Access Control | |
| Physical | Physical |

The IEEE has subdivided the data link layer into two sub layers:

- Logical link control (LLC)
- Medium access control (MAC)

LLC is non-architecture specific. The MAC sub layer contains a number of distinct modules, each carries proprietary information specific to the LAN product being used.

## 3. Why IPv6 is preferred than IPv4?

Through IPv6 we can identify more networks or systems than IPv4.

## 4. Define ICMP.

ICMP uses the source IP address to send the error message to the source of the datagram. ICMP always reports error messages to the original source.

## 5. Why we migrate from IPv4 to IPv6?

- Despite all short-term solutions, such as subnetting, classless addressing, and NAT, address depletion is still a long-term problem in the Internet.
- The Internet must accommodate real-time audio and video transmission. This type of transmission requires minimum delay strategies and reservation of resources not provided in the IPv4 design.
- The Internet must accommodate encryption and authentication of data for some applications. No encryption or authentication is provided by IPv4.

To overcome these deficiencies, IPv6 (Internetworking Protocol, version 6), also known as IPng (Internetworking Protocol, next generation), was proposed and is now a standard.

## 6. What is the use of NAT?

NAT (Network Address Translation) is the process where a network device, usually a firewall, assigns a public address to a computer inside a private network.

## 7. What are the responsibilities of network layer?

The network layer is responsible for the source-to-destination delivery of packet across multiple network links. The specific responsibilities of network layer include the following:

Logical addressing.

Routing.

## 8. What is a virtual circuit?

A logical circuit made between the sending and receiving computers. The connection is made after both computers do handshaking. After the connection, all packets follow the same route and arrive in sequence.

## 9. What are data grams?

In datagram approach, each packet is treated independently from all others. Even when one packet represents just a place of a multipacket transmission, the network treats it although it existed alone. Packets in this technology are referred to as datagram.

## 10. What are the two types of implementation formats in virtual circuits?

Virtual circuit transmission is implemented in 2 formats.

- Switched virtual circuit
- Permanent virtual circuit.

## 11. What is meant by switched virtual circuit?

Switched virtual circuit format is comparable conceptually to dial-up line in circuit switching. In this method, a virtual circuit is created whenever it is needed and exits only for the du ration of specific exchange.

## 12. What is meant by Permanent virtual circuit?

Permanent virtual circuits are comparable to leased lines in circuit switching. In this method, the same virtual circuit is provided between two uses on a continuous basis. The circuit is dedicated to the specific uses.

## 13. Define Routers.

Routers relay packets among multiple interconnected networks. They Route packets from one network to any of a number of potential destination networks on internet routers operate in the physical, data link and network layer of OSI model.

## 14. What is meant by hop count?

The pathway requiring the smallest number of relays, it is called hop-count routing, in which every link is considered to be of equal length and given the value one.

## 15. How can the routing be classified?

The routing can be classified as,

• Adaptive routing

• Non-adaptive routing.

## 16. What is time-to-live or packet lifetime?

As the time-to-live field is generated, each packet is marked with a life time, usually the number of h ops that are allowed before a packet is considered lost and accordingly, destroyed. The time-to-live determines the lifetime of a packet.

## 17. What is meant by brouter?

A brouter is a single protocol or multiprotocol router that sometimes act as a router and sometimes act as a bridge.

## 18. Write the keys for understanding the distance vector routing.

The three keys for understanding the algorithm are

Knowledge about the whole networks

Routing only to neighbors

• Information sharing at regular intervals

## 19. Write the keys for understanding the link state routing.

The three keys for understanding the algorithm are

• Knowledge about the neighborhood.

• Routing to all neighbors.

• Information sharing when there is a range.

## 20. How the packet cost referred in distance vector and link state routing?

In distance vector routing, cost refer to hop count while in case o f link state routing, cost is a weighted value based on a variety of factors such as security levels, traffic or the state of the link.

## 21. How the routers get the information about neighbor?

A router gets its information about its neighbors by periodically sending them a short greeting packet. If the neighborhood responds to the greeting as expected, it is assumed to be alive and functioning. If it does not, a change is assumed to have occurred and the sending router then alerts the rest of the network in its next LSP.

## 22. What are the four internetworking devices?

The four internetworking devices are,

- Repeaters
- Bridges
- Routers
- Gateway

## 23. Define IP address.

IP address is the 3-bit number for representing a host or system in the network. One portion of the IP address indicates a networking and the other represents the host in a network.

## 24. What is Token Bus?

Token Bus is a physical bus that operates as a logical ring using tokens. Here stations are logically organized into a ring. A token is passed among stations. If a station wants to send data, it must wait and capture the token. Like Ethernet, station communicates via a common bus.

## 25. What is token passing?

Stations may attempt to send data multiple times before a transmission makes it onto a link. This redundancy may create delays of indeterminable length if the traffic is heavy. Token ring resolves this uncertainty by requiring that stations take turns sending data. Each station may transmit only during its turn and may send only one frame during each turn. The mechanism that coordinates this rotation is called token passing.

## 26. Define Masking?

Masking is the process that extracts the address of the physical network from an IP address.

## 27. What are the rules of boundary-level masking?

The rules of boundary-level masking

- The bytes in the IP address that corresponds to 255 in the mask will be repeated in the subnetwork address
- The bytes in the IP address that corresponds to 0 in the mask will change to 0 in the subnetwork address

## 28. What are the rules of nonboundary-level masking?

- The bytes in the IP address that corresponds to 255 in the mask will be repeated in the subnetwork address
- The bytes in the IP address that corresponds to 0 in the mask will change to 0 in the subnetwork address
- For other bytes, use the bit-wise AND operator

## 29. Define Gateway.

A device used to connect two separate networks that we different communication protocols.

## 30. What is LSP?

In link state routing, a small packet containing routing information sent by a router to all other router by a packet called link state packet

## Glossary:

**Address Resolution Protocol (ARP):** In TCP/IP, a protocol for obtaining the physical addressof a node when the Internet address is known.

**Anycast Address:** An address that defines a group of computers with addresses that have thesame beginning.

**Base Header:** In IPv6, the main header of the datagram.

**Broadcast Address:** An address that allows transmission of a message to all nodes of a network.

**Broadcasting:** Transmission of a message to all nodes in a network.

**Checksum**:A value used for error detection. It is formed by adding data units using one'scomplement arithmetic and then complementing the result.

**Classful Addressing:** An IPv4 addressing mechanism in which the IP address space is dividedinto 5 classes: A, B, C, D, and E. Each class occupies some part of the whole address space.

**Classless Addressing:** An addressing mechanism in which the IP address space is not dividedinto classes.

**Client Process:** A running application program on a local site that requests service from arunning application program on a remote site.

**Compatible Address:** An IPv6 address consisting of 96 bits of zero followed by 32 bits of IPv4.

**Core-Based Tree (CBT):** In multicasting, a group-shared protocol that uses a center router asthe root of the tree.

**Datagram Network**:A packet-switched network in which packets are independent from eachother.

**Differentiated Services (DS or Diffserv):** A class-based QoS model designed for IF.

**Dijkstra's algorithm:** In link state routing, an algorithm that finds the shortest path to otherrouters.

**Direct Delivery:** A delivery in which the final destination of the packet is a host connected tothe same physical network as the sender.

**Distance Vector Multicast Routing Protocol (DVMRP):** A protocol based on distance vectorrouting that handles multicast routing in conjunction with IGMP.

**Distance Vector Routing:** A routing method in which each router sends its neighbors a list ofnetworks it can reach and the distance to that network.

**Dynamic Host Configuration Protocol (DHCP):** An extension to BOOTP that dynamicallyassigns configuration information.

**Firewall:** A device (usually a router) installed between the internal network of an organizationand the rest of the Internet to provide security.

**Forwarding:** Placing the packet in its route to its destination.

**Fragmentation:** The division of a packet into smaller units to accommodate a protocol's MTU.

**Frame:** A group of bits representing a block of data.

**Integrated Services (IntServ):** A flow-based QoS model designed for IP.

**Internet address:** A 32-bit or l28-bit network-layer address used to uniquely define a host on aninternet using the TCP/IP protocol.

**Internet Control Message Protocol (ICMP):** A protocol in the TCP/IP protocol suite thathandles error and control messages.

**Internet Control Message Protocol, version 6 (ICMPv6):** A protocol in IPv6 that handleserror and control messages.

**Internet Group Management Protocol (IGMP):** A protocol in the TCP/IP protocol suite thathandles multicasting.

**Internet Protocol (lP):** The network-layer protocol in the TCP/IP protocol suite governingconnectionless transmission across packet switching networks.

**Internet Protocol version 4 (IPv4):** The current version of Internet Protocol.

**Internet Protocol, version 6 (IPv6):** The sixth version of the Internet Protocol.

**Link State Routing:** A routing method in which each router shares its knowledge of changes inits neighborhood with all other routers.

**Mapped Address:** An IPv6 address used when a computer that has migrated to IPv6 wants tosend a packet to a computer still using IPv4.

**Multicast Routing:** Moving a multicast packet to its destinations.

**Multiple Unicasting:**Sending multiple copies of a message, each with a different unicastaddress.

**Network Address Translation (NAT):** A technology that allows a private network to use a setof private addresses for internal communication and a set of global Internet addresses for external communication.

**Open Shortest Path First (OSPF):** An interior routing protocol based on link state routing.

**Path Vector Routing:** A routing method on which BGP is based; in this method, the ASSthrough which a packet must pass is explicitly listed.

**Protocol Independent Multicast (PIM):** A multicasting protocol family with two members,PIM-DM and PIM-SM; both protocols are unicast-protocol dependent.

**Protocol Independent Multicast, Dense Mode (PIM-DM):** A source-based routing protocolthat uses RPF and pruning/grafting strategies to handle multicasting.

**Protocol Independent Multicast, Sparse Mode (PIM-SM):** A group-shared routing protocolthat is similar to CBT and uses a rendezvous point as the source of the tree.

**Reverse Address Resolution Protocol (RARP):** A TCPIIP protocol that allows a host to find itsInternet address given its physical address.

**Unicast Address:** An address belonging to one destination.

**Unicast Routing:** The sending of a packet to just one destination.

**Unicasting:** The sending of a packet to just one destination.

**Important Short Questions and Answers: Computer Transport Layer**

### 1. What is function of transport layer?

The protocol in the transport layer takes care in the delivery of data from one application program on one device to an application program on another device. They act as a link between the upper layer protocols and the services provided by the lower layer.

### 2. What are the duties of the transport layer?

The services provided by the transport layer End-to-end delivery, Addressing, Reliable delivery, Flow control & Multiplexing

### 3. What is the difference between network layer delivery and the transport layer delivery? Network layer delivery

The network layer is responsible for the source-to-destination delivery of packet across multiple network links.

### Transport layer delivery

The transport layer is responsible for source-to-destination delivery of the entire message.

### 4. What are the four aspects related to the reliable delivery of data?

The four aspects are,

Error control, Sequence control, Loss control & Duplication control

### 5. What is meant by segment?

At the sending and receiving end of the transmission, TCP divides long transmissions into smaller data units and packages each into a frame called a segment.

### 6. What is meant by segmentation?

When the size of the data unit received from the upper layer is too long for the network layer datagram or data link layer frame to handle, the transport protocol divides it into smaller usable blocks. The dividing process is called segmentation.

### 7. What is meant by Concatenation?

The sizes of the data unit belonging to a single session are so small that several can fit together into a single datagram or frame, the transport protocol combines them into a single data unit. The combining process is called concatenation.

## 8. Explain the main idea of UDP.

UDP is called a connectionless, unreliable transport protocol. It does not add anything to the services of IP except to provide process-to-process communication instead of host-to-host communication. Also, it performs very limited error checking.

### 9. What are the two possible transport services?

Two basic types of transport services are,

Connection service

Connectionless services

## 10. The transport layer creates the connection between source and destination. What are the three events involved in the connection?

For security, the transport layer may create a connection between the two end ports. A connection is a single logical path between the source and destination that is associated with all packets in a message. Creating a connection involves three steps:

- Connection establishment
- Data transfer & Connection release.

## 11. Name the parameters of quality of services in a network.

Reliability, Delay, Jitter & Bandwidth.

## 12. What is meant by congestion? Why the congestion occur in network?

Congestion in a network occurs if user sends data into the network at a rate greater than that allowed by network resources. Congestion occurs because the switches in a network have a limited buffer size to store arrived packets.

## 13. What is Three-way Handshaking?

The connection establishment in TCP is called three-way handshaking. The process starts with the server. The server program tells its TCP that it ready to accept a connection. This is called a request for a passive open. Although the server TCP is ready to accept any connection from any machine in the world, it cannot make the connection itself.

The client program issues a request for an active open. A client that wishes to connect to an open server tells its TCP that it needs to be connected to that particular server. TCP can now start the three-way handshaking process.

## 14. How will the congestion be avoided?

The congestion may be avoided by two bits

BECN - Backward Explicit Congestion Notification

FECN - Forward Explicit Congestion Notification

## 15. What is the function of BECN BIT?

The BECN bit warns the sender of congestion in network. The sender can respond to this warning by simply reducing the data rate.

## 16. What is the function of FECN?

The FECN bit is used to warn the receiver of congestion in the network. The sender and receiver are communicating with each other and are using some types of flow control at a higher level.

## 17. What is meant by quality of service? What are the two categories of QoS attributes?

The quality of service defines a set of attributes related to the performance of the connection. For each connection, the user can request a particular attribute each service class is associated with a set of attributes.

The two main categories are

- User Oriented
- Network Oriented

## 18. What is TCP?

TCP guarantees the reliable, in order delivery of a stream of bytes. It is a full-duplex protocol, meaning that each TCP connection supports a pair of byte streams, one flowing in each direction.

## 19. List out the user related attributes?

User related attributes are

SCR – Sustainable Cell Rate

PCR – Peak Cell Rate

MCR- Minimum Cell Rate

CVDT – Cell Variation Delay Tolerance

## 20. What are the networks related attributes?

The network related attributes are,
Cell loss ratio (CLR)

Cell transfer delay (CTD)

Cell delay variation (CDV)

Cell error ratio (CER)

## 21. What is frame? What is framing bits?

A frame consists of one complete cycle of time slots, including one or more slot dedicated to each sending device. One or more synchronization bits are usually added to the beginning of each frame. These bitts are called framing bits.

## 22. What is interleaving?

The switch moves from device to device at a constant rate and fixed order. This process is called interleaving.

## 23. Give the difference between service point address, logical address & physical address? Service point addressing

The transport layer header includes a type of address called a service point address or port address, which makes a data delivery from a specific process on one computer to a specific process on another computer.

## Logical addressing

If a packet passes the network boundary we need another addressing to differentiate the source and destination systems. The network layer adds headers, which indicate the logical address of the sender and receiver.

## Physical addressing

If the frames are to be distributed to different systems on the network, the data link layer adds the header, which defines the source machine's address and the destination machine's address.

## Glossary:

**Congestion:** Excessive network or internetwork traffic causing a general degradation of service

**First-In, First-Out (FIFO) Queue:** A queue in which the first item in is the first item out.

**Forward Explicit Congestion Notification (FECN):** A bit in the Frame Relay packet thatnotifies the destination of congestion.

**Internet Assigned Numbers Authority (IANA):** A group supported by the U.S. governmentthat was responsible for the management of Internet domain names and addresses until October 1998.

**Leaky Bucket Algorithm:** An algorithm to shape bursty traffic.

**Priority Queueing:** A queuing technique in which packets are assigned to a priority class, eachwith its own queue.

**Pseudoheader:** Information from the IP header used only for checksum calculation in the UDPand TCP packet.

**Quality of Service (QoS):** A set of attributes related to the performance of the connection.

**Socket Address:** A structure holding an IP address and a port number.

**Token:** A small packet used in token-passing access method.

**Token Bucket:** An algorithm that allows idle hosts to accumulate credit for the future in theform of tokens.

**Token Passing:** An access method in which a token is circulated in the network. The station thatcaptures the token can send data.

**Transmission Control Protocol (TCP)**: A transport protocol in the TCP/IP protocol suite.

**User Datagram Protocol (UDP)**: A connectionless TCP/IP transport layer protocol.

**Weighted Fair Queuing:** A packet scheduling technique to improve QoS in which the packetsare assigned to queues based on a given priority number.

**Important Short Questions and Answers: Application Layer**

**1. What is the purpose of Domain Name System?**

Domain Name System can map a name to an address and conversely an address to name.

## 2. Discuss the three main division of the domain name space.

Domain name space is divided into three different sections: generic domains, country domains & inverse domain.

**Generic domain:** Define registered hosts according to their generic behavior, uses genericsuffixes.

**Country domain:** Uses two characters to identify a country as the last suffix. **Inverse domain:** Finds the domain name given the IP address.

## 3. Discuss the TCP connections needed in FTP.

FTP establishes two connections between the hosts. One connection is used for data transfer, the other for control information. The control connection uses very simple rules of communication. The data connection needs more complex rules due to the variety of data types transferred.

## 4. Discuss the basic model of FTP.

The client has three components: the user interface, the client control process, and the client data transfer process. The server has two components: the server control process and the server data transfer process. The control connection is made between the control processes. The data connection is made between the data transfer processes.

## 5. What is the function of SMTP?

The TCP/IP protocol supports electronic mail on the Internet is called Simple Mail Transfer (SMTP). It is a system for sending messages to other computer users based on e-mail addresses. SMTP provides mail exchange between users on the same or different computers.

## 6. What is the difference between a user agent (UA) and a mail transfer agent? (MTA)?

The UA prepares the message, creates the envelope, and puts the message in the envelope. The MTA transfers the mail across the Internet.

## 7. How does MIME enhance SMTP?

MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP. MIME transforms non-ASCII data at the sender site to NVT ASCII data and deliverers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original data.

## 8. Why is an application such as POP needed for electronic messaging?

Workstations interact with the SMTP host which receives the mail on behalf of every host in the organization, to retrieve messages b y using a client-server protocol such as Post Office Protocol , version 3(POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.

## 9. Write down the three types of WWW documents.

The documents in the WWW can be grouped into three broad categories: static, dynamic and active.

**Static:** Fixed-content documents that are created and stored in a server. **Dynamic:** Created by web server whenever a browser requests the document. **Active:** A program to be run at the client side.

## 10. What is the purpose of HTML?

HTML is a computer language for specifying the contents and format of a web document. It allows additional text to include codes that define fonts, layouts, embedded graphics and hypertext links.

## 11. Define CGI.

CGI is a standard for communication between HTTP servers and executable programs. It is used in crating dynamic documents.

### 12. Name four factors needed for a secure network.

**Privacy:** The sender and the receiver expect confidentiality.

**Authentication:** The receiver is sure of the sender's identity and that an imposter has not sentthe message.

**Integrity:** The data must arrive at the receiver exactly as it was sent.

**Non-Reputation:** The receiver must able to prove that a received message came from a specificsender.

## 13. How is a secret key different from public key?

In secret key, the same key is used by both parties. The sender uses this key and an encryption algorithm to encrypt data; the receiver uses the same key and the corresponding decryption algorithm to decrypt the data. In

public key, there are two keys: a private key and a public key. The private key is kept by the receiver. The public key is announced to the public.

## 14. What is a digital signature?

Digital Signature is an electronic signature that can be used to authenticate the identity of the sender of a message or document and possibly to ensure that the original content of the message or document that has been sent is unchanged. Digital signature is easily transportable, cannot be imitated by someone else, and can be automatically time-stamped. The ability to ensure that the original signed message arrived means that the sender cannot easily repudiate it later.

## 15. What are the advantages & disadvantages of public key encryption? Advantages:

Remove the restriction of a shared secret key between two entities. Here each entity can create a pair of keys, keep the private one, and publicly distribute the other one.

a) The no. of keys needed is reduced tremendously. For one million users to communicate, only two million keys are needed.

## Disadvantage:

If you use large numbers the method to be effective. Calculating the cipher text using the long keys takes a lot of time. So it is not recommended for large amounts of text.

## 16. What are the advantages & disadvantages of secret

## key encryption? Advantage:

Secret Key algorithms are efficient: it takes less time to encrypt a message. The reason is that the key is usually smaller. So it is used to encrypt or decrypt long messages.

## Disadvantages:

a) Each pair of users must have a secret key. If N people in world want to use this method, there needs to be N (N-1)/2 secret keys. For one million people to communicate, a half-billion secret keys are needed.

b) The distribution of the keys between two parties can be difficult.

## 17. Define permutation.

Permutation is transposition in bit level.

**Straight permutation:** The no. of bits in the input and output are preserved.

**Compressed permutation:** The no. of bits is reduced (some of the bits are dropped).

**Expanded permutation:** The no. of bits is increased (some bits are repeated).

## 18. Define substitution & transposition encryption.

**Substitution:** A character level encryption in which each character is replaced by anothercharacter in the set.

**Transposition:** A Character level encryption in which the characters retain their plaintext but theposition of the character changes.

## Glossary:

**Application layer:** The fifth layer in the Internet model; provides access to network resources.

**Authentication:** Verification of the sender of a message.

**Authentication Server (AS):** The KDC in the Kerberos protocol.

**Browser:** An application program that displays a WWW document. A browser usually usesother Internet services to access the document.

**Challenge Handshake Authentication Protocol (CHAP):** In PPp, a three-way handshakingprotocol used for authentication.

**Cipher:** An encryption/decryption algorithm.
**Cipher Feedback Mode (CFB):** A DES and triple DES operation mode in which data is sentand received 1 bit at a time, with each bit independent of the previous bits.

**Cipher Stream Mode (CSM):** A DES and triple DES operation mode in which data is sent andreceived 1 byte at a time.

**Ciphertext:** The encrypted data.

**Common Gateway Interface (CGI):** A standard for communication between HTTP serversandexecutable programs. CGI is used in creating dynamic documents.

**Cookie:** A string of characters that holds some information about the client and must be returnedto the server untouched.

**Diffie-Hellman protocol:** A key management protocol that provides a one-time session key fortwo parties.

**Digital Signature:** A method to authenticate the sender of a message.

**DNS server:** A computer that holds information about the name

space. **Domain Name:** In the DNS, a sequence of labels separated by

dots.

**Domain Name Space:** A structure for organizing the name space in which the names are definedin an inverted-tree structure with the root at the top.

**Domain Name System (DNS):**A TCP/IP application service that converts user-friendly namesto IP addresses.

**File Transfer Protocol (FTP):** In TCPIIP, an application layer protocol that transfers filesbetween two sites.

**Firewall:** A device (usually a router) installed between the internal network of an organizationand the rest of the Internet to provide security.

**Fully Qualified Domain Name (FQDN):** A domain name consisting of labels beginning withthe host and going back through each level to the root node.

**Generic Domain:** A subdomain in the domain name system that uses generic suffixes.

**Hashed-Message Authentication Code (HMAC):** A MAC based on a keyless hash functionsuch as SHA-l.

**HyperText Markup Language (HTML):** The computer language for specifying the contentsand format of a web document. It allows additional text to include codes that define fonts, layouts, embedded graphics, and hypertext links.

**HyperText Transfer Protocol (HTTP):** An application service for retrieving a web document.

**Inverse Domain**: A subdomain in the DNS that finds the domain name given the IP address.**Kerberos:** An authentication protocol used by Windows 2000.

**Key Distribution Center (KDC):** In secret key encryption, a trusted third party that shares a keywith each user.

**Partially Qualified Domain Name (PQDN):** A domain name that does not include all the levelsbetween the host and the root node.

**Password Authentication Protocol (PAP):** A simple two-step authentication protocol used inPPP.

**Routing Information Protocol (RIP):** A routing protocol based on the distance vector routingalgorithm.

**Important Short Questions and Answers : Computer Networks - Fundamentals & Link Layer**

**1. What are the three criteria necessary for an effective and efficient network?**

The most important criteria are performance, reliability and security.

*Performance* of the network depends on number of users, type of transmission medium, and the capabilities of the connected h/w and the efficiency of the s/w.

*Reliability* is measured by frequency of failure, the time it takes a link to recover from the failure and the network's robustness in a catastrophe.

*Security* issues include protecting data from unauthorized access and viruses.

## 2. Group the OSI layers by function?

The seven layers of the OSI model belonging to three subgroups.

Physical, data link and network layers are the *network support layers*; they deal with the physical aspects of moving data from one device to another.

Session, presentation and application layers are the *user support layers*; they allow interoperability among unrelated software systems.

The transport layer ensures *end-to-end reliable data transmission*.

## 3. What are header and trailers and how do they get added and removed?

Each layer in the sending machine adds its own information to the message it receives from the layer just above it and passes the whole package to the layer just below it. This information is added in the form of headers or trailers. Headers are added to the message at the layers 6,5,4,3, and 2. A trailer is added at layer2. At the receiving machine, the headers or trailers attached to the data unit at the corresponding sending layers are removed, and actions appropriate to that layer are taken.

## 4. What are the features provided by layering?

Two nice features:

- It decomposes the problem of building a network into more manageable components.
- It provides a more modular design.

## 5. Why are protocols needed?

In networks, communication occurs between the entities in different systems. Two entities cannot just send bit streams to each other and expect to be understood. For communication, the entities must agree on a protocol. A protocol is a set of rules that govern data communication.

## 6. What are the two interfaces provided by protocols?

- Service interface
- Peer interface

Service interface- defines the operations that local objects can perform on the protocol.

Peer interface- defines the form and meaning of messages exchanged between protocol peers to implement the communication service.

## 7. Mention the different physical media?

- Twisted pair(the wire that your phone connects to)
- Coaxial cable(the wire that your TV connects to)
- Optical fiber(the medium most commonly used for high-bandwidth, long-distance links)
- Space(the stuff that radio waves, microwaves and infra red beams propagate through)

## 8. Define Signals?

Signals are actually electromagnetic waves traveling at the speed of light. The speed of light is, however, medium dependent-electromagnetic waves traveling through copper and fiber do so at about two-thirds the speed of light in vacuum.

## 9. What is wave's wavelength?

The distance between a pair of adjacent maxima or minima of a wave, typically measured in meters, is called wave's wavelength.

## 10. Define Modulation?

Modulation -varying the frequency, amplitude or phase of the signal to effect the transmission of information. A simple example of modulation is to vary the power (amplitude) of a single wavelength.

## 11. Explain the two types of duplex?

- *Full duplex*-two bit streams can be simultaneously transmitted over the links at the same time, one going in each direction.
- *Half duplex*-it supports data flowing in only one direction at a time.

## 12. What is CODEC?

A device that encodes analog voice into a digital ISDN link is called a CODEC, for *coder/decoder*.

## 13. What is spread spectrum and explain the two types of spread spectrum?

Spread spectrum is to spread the signal over a wider frequency band than normal in such a way as to minimize the impact of interference from other devices.

- Frequency Hopping
- Direct sequence

## 14. What are the different encoding techniques?

- NRZ
- NRZI
- Manchester
- 4B/5B

## 15. How does NRZ-L differ from NRZ-I?

In the NRZ-L sequence, positive and negative voltages have specific meanings: positive for 0 and negative for 1. in the NRZ-I sequence, the voltages are meaningless.

Instead, the receiver looks for changes from one level to another as its basis for recognition of 1s.

## 16. What are the responsibilities of data link layer?

Specific responsibilities of data link layer include the following. a) Framing b) Physical addressing c) Flow control d) Error control e) Access control.

## 17. What are the ways to address the framing problem?

- Byte-Oriented Protocols(PPP)
- Bit-Oriented Protocols(HDLC)
- Clock-Based Framing(SONET)

## 18. Distinguish between peer-to-peer relationship and a primary-secondary relationship. peer -to- peer relationship?

All the devices share the link equally.

Primary-secondary relationship: One device controls traffic and the others must transmit through it.

## 19. Mention the types of errors and define the terms?

There are 2 types of errors

- Single-bit error.
- Burst-bit error.

Single bit error: The term single bit error means that only one bit of a given data unit (such as byte character/data unit or packet) is changed from 1 to 0 or from 0 to 1.

Burst error: Means that 2 or more bits in the data unit have changed from 1 to 0 from 0 to 1.

## 20. List out the available detection methods.

There are 4 types of redundancy checks are used in data communication.

- Vertical redundancy checks (VRC).
- longitudinal redundancy checks (LRC).
- cyclic redundancy checks (CRC).
- Checksum.

## 21. Write short notes on VRC.

The most common and least expensive mechanism for error detection is the vertical redundancy check (VRC) often called a parity check. In this technique a redundant bit called a parity bit, is appended to every data unit so, that the total number of 0's in the unit (including the

parity bit) becomes even.

## 22. Write short notes on LRC.

In longitudinal redundancy check (LRC), a block of bits is divided into rows and a redundant row of bits is added to the whole block.

## 23. Write short notes on CRC.

The third and most powerful of the redundancy checking techniques is the cyclic redundancy checks (CRC) CRC is based on binary division. Here a sequence of redundant bits, called the CRC remainder is appended to the end of data unit.

## 24. Write short notes on CRC checker.

A CRC checker functions exactly like a generator. After receiving the data appended with the CRC it does the same modulo-2 division. If the remainder is all 0's the CRC is dropped and

the data accepted. Otherwise, the received stream of bits is discarded and the dates are resent.

## 25. Define checksum.

The error detection method used by the higher layer protocol is called checksum. Checksum is based on the concept of redundancy.

## 26. What are the steps followed in checksum generator?

The sender follows these steps a) the units are divided into k sections each of n bits. b)

All sections are added together using 2's complement to get the sum. c) The sum is complemented and become the checksum. d) The checksum is sent with the data.

## 27. Mention the types of error correcting methods.

There are 2 error-correcting methods.

- Single bit error correction
- Burst error correction.

## 28. Write short notes on error correction?

It is the mechanism to correct the errors and it can be handled in 2 ways.

- When an error is discovered, the receiver can have the sender retransmit the entire data unit.
- A receiver can use an error correcting coder, which automatically corrects certain errors.

## 29. What is the purpose of hamming code?

A hamming code can be designed to correct burst errors of certain lengths. So the simple strategy used by the hamming code to correct single bit errors must be redesigned to be applicable for multiple bit correction.

## 30. What is redundancy?

It is the error detecting mechanism, which means a shorter group of bits or extra bits may be appended at the destination of each unit.

## 31. Define flow control?

Flow control refers to a set of procedures used to restrict the amount of data. The sender can send before waiting for acknowledgment.

## 32. Mention the categories of flow control?

There are 2 methods have been developed to control flow of data across communication links. a) Stop and wait- send one from at a time. b) Sliding window- send several frames at a time.

## 33. What is a buffer?

Each receiving device has a block of memory called a buffer, reserved for storing incoming data until they are processed.

**Important Short Questions and Answers: Media Access & Internetworking**

### 1. What are the functions of MAC?

MAC sub layer resolves the contention for the shared media. It contains synchronization, flag, flow and error control specifications necessary to move information from one place to another, as well as the physical address of the next station to receive and route a packet.

## 2. What are the functions of LLC?

The IEEE project 802 models take the structure of an HDLC frame and divides it into 2 sets of functions. One set contains the end user portion of the HDLC frame – the logical address, control information, and data. These functions are handled by the IEEE 802.2 logical link control (LLC) protocol.

## 3. What is Ethernet?

Ethernet is a multiple-access network, meaning that a set of nodes send and receive frames over a shared link.

## 4. Define the term carrier sense in CSMA/CD?

All the nodes can distinguish between idle and a busy-link and "collision detect" means that a node listens as it transmits and can therefore detect when a frame it is transmitting has interfered (collided) with a frame transmitted by another node.

## 5. Define Repeater?

A repeater is a device that forwards digital signals, much like an amplifier forwards analog signals. However, no more than four repeaters may be positioned between any pairs of hosts, meaning that an Ethernet has a total reach of only 2,500m.

## 6. Define collision detection?

In Ethernet, all these hosts are competing for access to the same link, and as a consequence, they are said to be in the same collision detection.

### 7. Why Ethernet is said to be a I-*persistent* protocol?

An adaptor with a frame to send transmits with probability '1 'whenever a busy line goes idle.

## 8. What is exponential back off?

Once an adaptor has detected a collision and stopped its transmission, it waits a certain amount of time and tries again. Each time it tries to transmit but fails, the adaptor doubles the amount of time it waits before trying again. This strategy of doubling the delay interval between each transmission attempt is a general technique known as exponential back off.

## 9. What is token holding time (THT)?

It defines that how much data a given node is allowed to transmit each time it possesses the token or equivalently, how long a given node is allowed to hold the token.

## 10. What are the two classes of traffic in FDDI?

- Synchronous
- Asynchronous

## 11. What are the four prominent wireless technologies?

- Bluetooth
- Wi-Fi(formally known as 802.11)
- WiMAX(802.16)
- Third generation or 3G cellular wireless.

## 12. Define Bluetooth?

Bluetooth fills the niche of very short-range communication between mobile phones, PDAs, notebook computers, and other personal or peripheral devices. For example, Bluetooth can be used to connect mobile phones to a headset, or a notebook computer to a printer.

## 13. What are the four steps involves in scanning?

1. The node sends a Probe frame.
2. All APs within reach reply with a Probe Response frame.
3. The node selects one of the access points, and sends that AP an Association Request frame.
4. The AP replies with an Association Response frame.

## 14. Explain the term handoff?

If the phone is involved in a call at the time , the call must be transferred to the new base station in what is called a hand off.

## 15. Define satphones?

Satphones use communication satellites as base stations, communicating on frequency bands that have been reserved internationally for satellite use.

## 16. How to mediate access to a shared link?

Ethernet,token ring, and several wireless protocols. Ethernet and token ring media access protocols have no central arbitrator of access. Media access in wireless networks is made more complicated by the fact that some nodes may be hidden from each other due to range limitations of radio transmission.

## 17. Define Aggregation points?

It collects and processes the data they receive from neighboring nodes, and then transmit the processed data. By processing the data incrementally, instead of forwarding all the raw data to the base station, the amount of traffic in the network is reduced.

## 18. Define Beacons?

Beacon to determine their own absolute locations based on GPS or manual configuration. The majority of nodes can then derive their absolute location by combining an estimate of their position relative to the beacons with the absolute location information provided by the beacons.

## 19. What is the use of Switch?

It is used to forward the packets between shared media LANs such as Ethernet. Such switches are sometimes known by the obvious name of LAN switches.

## 20. Explain Bridge?

It is a collection of LANs connected by one or more bridges is usually said to form an extended LAN. In their simplest variants, bridges simply accept LAN frames on their inputs and forward them out on all other outputs.

## 21. What is Spanning tree?

It is for the bridges to select the ports over which they will forward frames.

## 22. What are the three pieces of information in the configuration messages?

1. The ID for the bridge that is sending the message.
2. The ID for what the sending bridge believes to the root bridge.
3. The distance, measured in hops, from the sending bridge to the root bridge.

## 23. What is broadcast?

Broadcast is simple – each bridge forwards a frame with a destination broadcast address out on each active (selected) port other than the one on which the frame was received.

## 24. What is multicast?

It can be implemented with each host deciding for itself whether or not to accept the message.

## 25. How does a given bridge learn whether it should forward a multicast frame over a given port?

It learns exactly the same way that a bridge learns whether it should forward a unicast frame over a particular port- by observing the source addresses that it receives over that port.

## 26. What are the limitations of bridges?

- scale
- heterogeneity

**Important Questions and Answers: Routing**

**1. Define packet switching?**

A packet switch is a device with several inputs and outputs leading to and from the hosts that the switch interconnects.

## 2. What is a virtual circuit?

A logical circuit made between the sending and receiving computers. The connection is made after both computers do handshaking. After the connection, all packets follow the same route and arrive in sequence.

## 3. What are data grams?

In datagram approach, each packet is treated independently from all others. Even when one packet represents just a place of a multi packet transmission, the network treats it although it existed alone. Packets in this technology are referred to as datagram.

## 4. What is meant by switched virtual circuit?

Switched virtual circuit format is comparable conceptually to dial-up line in circuit switching. In this method, a virtual circuit is created whenever it is needed and exits only for the duration of specific exchange.

## 5. What is meant by Permanent virtual circuit?

Permanent virtual circuits are comparable to leased lines in circuit switching. In this method, the same virtual circuit is provided between two uses on a continuous basis. The circuit is dedicated to the specific uses.

## 6. What are the properties in star topology?

- Even though a switch has a fixed number of inputs and outputs, which limits the number of hosts that can be connected to a single switch , large networks can be built by interconnecting a number of switches.
- We can connect switches to each other and to hosts using point-to point links, which typically means that we can build networks of large geographic scope.

## 7. What is VCI?

A Virtual Circuit Identifier that uniquely identifies the connection at this switch, and which will be carried inside the header of the packets that belongs to this connection.

## 8. What is hop-by-hop flow control?

Each node is ensured of having the buffers it needs to queue the packets that arrive on that circuit. This basic strategy is usually called hop-by-hop flow control.

## 9. Explain the term best-effort?

If something goes wrong and the packet gets lost, corrupted, misdelivered, or in any way fails to reach its intended destination, the network does nothing.

### 10. What is maximum transmission unit?

MTU- which is the largest IP datagram that it can carry in a frame .

### 11. Define Routing?

It is the process of building up the tables that allow thwe collect output for a packet to be determined.

### 12. Define ICMP?

Internet Control Message Protocol is a collection of error messages that are sent back to the source host whenever a router or host is unable to process an IP datagram successfully

### 13. Write the keys for understanding the distance vector routing?

The three keys for understanding the algorithm are,

- Knowledge about the whole networks
- Routing only to neighbors
- Information sharing at regular intervals

### 14. Write the keys for understanding the link state routing?

The three keys for understanding the algorithm are,

- Knowledge about the neighborhood.
- Routing to all neighbors.
- Information sharing when there is a range.

### 15. How the packet cost referred in distance vector and link state routing?

In distance vector routing, cost refer to hop count while in case of link state routing, cost is a weighted value based on a variety of factors such as security levels, traffic or the state of the link.

### 16. Define Reliable flooding?

It is the process of making sure that all the nodes participating in the routing protocol get a copy of the link state information from all the other nodes.

### 17. What are the features in OSPF?

- Authentication of routing messages.
- Additional hierarchy.
- Load balancing.

### 18. Define Subnetting?

Subnetting provides an elegantly simple way to reduce the total number of network numbers that are assigned. The idea is to take a single IP network number and allocate the IP address with that network to several physical networks, which are now referred to as subnets.

### 19. What are the different types of AS?

- Stub AS
- Multi homed AS
- Transit AS

### 20. What is an Area?

An Area is a set of routers that are administratively configured to exchange link-state information with each other. There is one special area- the backbone area, also known as area 0.

### 21. What is Source Specific Multicast?

SSM , a receiving host specifies both a multicast group and a specific host .the receiving host would then receive multicast addressed to the specified group, but only if they are from the special sender.

### 22. What is meant by congestion?

Congestion in a network occurs if user sends data into the network at a rate greater than that allowed by network resources.

### 23. Why the congestion occurs in network?

Congestion occurs because the switches in a network have a limited buffer size to store arrived packets.

### 24. What are the rules of non boundary-level masking?

- The bytes in the IP address that corresponds to 255 in the mask will be repeated in the sub network address
- The bytes in the IP address that corresponds to 0 in the mask will change to 0 in the sub network address
- For other bytes, use the bit-wise AND operator.

### 25. What is LSP?

In link state routing, a small packet containing routing information sent by a router to all other router by a packet called link state packet.

**Important Short Questions and Answers: Transport Layer**

#### 1. Explain the main idea of UDP?

The basic idea is for a source process to send a message to a port and for the destination process to receive the message from a port.

### 2. What are the different fields in pseudo header?

- Protocol number
- Source IP address
- Destination IP addresses.

### 3. Define TCP?

TCP guarantees the reliable, in order delivery of a stream of bytes. It is a full-duplex protocol, meaning that each TCP connection supports a pair of byte streams, one flowing in each direction.

### 4. Define Congestion Control?

It involves preventing too much data from being injected into the network, thereby causing switches or links to become overloaded. Thus flow control is an end to an end issue, while congestion control is concerned with how hosts and networks interact.

### 5. State the two kinds of events trigger a state transition?

- A segment arrives from the peer.
- The local application process invokes an operation on TCP.

### 6. What is meant by segment?

At the sending and receiving end of the transmission, TCP divides long transmissions into smaller data units and packages each into a frame called a segment.

### 7. What is meant by segmentation?

When the size of the data unit received from the upper layer is too long for the network layer datagram or data link layer frame to handle, the transport protocol divides it into smaller usable blocks. The dividing process is called segmentation.

### 8. What is meant by Concatenation?

The size of the data unit belonging to single sessions are so small that several can fit together into a single datagram or frame, the transport protocol combines them into a single data unit. The combining process is called concatenation.

### 9. What is rate based design?

Rate- based design, in which the receiver tells the sender the rate-expressed in either bytes or packets per second – at which it is willing to accept incoming data.

### 10. Define Gateway.

A device used to connect two separate networks that use different communication protocols.

### 11. What is meant by quality of service?

The quality of service defines a set of attributes related to the performance of the connection. For each connection, the user can request a particular attribute each service class is associated with a set of attributes.

## 12. What are the two categories of QoS attributes?

The two main categories are,

- User Oriented
- Network Oriented

## 13. List out the user related attributes?

User related attributes are SCR – Sustainable Cell Rate PCR – Peak Cell Rate MCR-Minimum Cell Rate CVDT – Cell Variation Delay Tolerance.

## 14. What are the networks related attributes?

The network related attributes are, Cell loss ratio (CLR) Cell transfer delay (CTD) Cell delay variation (CDV) Cell error ratio (CER).

## 15. What is RED?

Random Early Detection in each router is programmed to monitor its own queue length and when it detects that congestion is imminent, to notify the source to adjust its congestion window.

## 16. What are the three events involved in the connection?

For security, the transport layer may create a connection between the two end ports. A connection is a single logical path between the source and destination that is associated with all packets in a message. Creating a connection involves three steps:

- Connection establishment
- Data transfer
- Connection release

## 17. What is Silly Window Syndrome?

If the sender or the receiver application program processes slowly and can send only 1 byte of data at a time, then the overhead is high.This is because to send one byte of data, 20 bytes of TCP header and 20 bytes of IP header are sent. This is called as silly window syndrome.

**Important Questions and Answers : Networks - Application Layer**

### 1. What is the function of SMTP?

The TCP/IP protocol supports electronic mail on the Internet is called Simple Mail Transfer (SMTP). It is a system for sending messages to other computer users based on e-mail addresses. SMTP provides mail exchange between users on the same or different computers.

## 2. What is the difference between a user agent (UA) and a mail transfer agent (MTA)?

The UA prepares the message, creates the envelope, and puts the message in the envelope. The MTA transfers

the mail across the Internet.

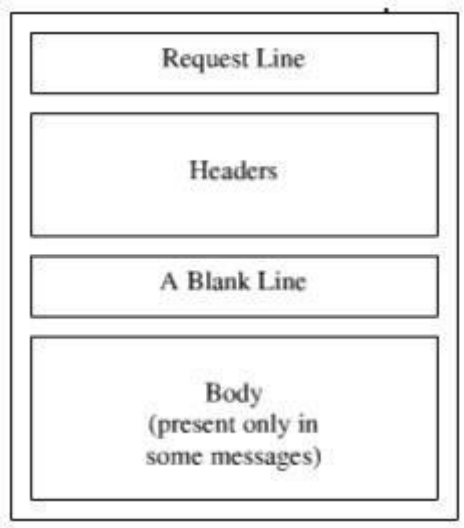
## 3.How does MIME enhance SMTP?

MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP. MIME transforms non-ASCII data at the sender site to NVT ASCII data and deliverers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original data.

## 4.Why is an application such as POP needed for electronic messaging?

Workstations interact with the SMTP host, which receives the mail on behalf of every host in the organization, to retrieve messages by using a client-server protocol such as Post Office Protocol, version 3(POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.

**5.** Give the format of HTTP request message?




## 6.What is the purpose of Domain Name System?

Domain Name System can map a name to an address and conversely an address to name.

## 7.Discuss the three main division of the domain name space.

Domain name space is divided into three different sections: generic domains, country domains & inverse domain.
Generic domain: Define registered hosts according to their generic behavior, uses generic suffixes.

Country domain: Uses two characters to identify a country as the last suffix.

Inverse domain: Finds the domain name given the IP address.

## 8.Discuss the TCP connections needed in FTP.

FTP establishes two connections between the hosts. One connection is used for data transfer, the other for control information. The control connection uses very simple rules of communication. The data connection needs more complex rules due to the variety of data types transferred.

## 9. Discuss the basic model of FTP.

The client has three components: the user interface, the client control process, and the client data transfer process. The server has two components: the server control process and the server data transfer process. The control connection is made between the control processes. The data connection is made between the data transfer processes.

## 10. Name four factors needed for a secure network?

*Privacy:* The sender and the receiver expect confidentiality.

*Authentication*: The receiver is sure of the sender's identity and that an imposter has not sent the message.

*Integrity*: The data must arrive at the receiver exactly as it was sent.

*Non-Reputation*: The receiver must able to prove that a received message came from a specific sender.

## 11. How is a secret key different from public key?

In secret key, the same key is used by both parties. The sender uses this key and an encryption algorithm to encrypt data; the receiver uses the same key and the corresponding decryption algorithm to decrypt the data. In public key, there are two keys: a private key and a public key. The private key is kept by the receiver. The public key is announced to the public.

## 12. What is a digital signature?

Digital signature is a method to authenticate the sender of a message. It is similar to that of signing transactions documents when you do business with a bank. In network transactions, you can create an equivalent of an electronic or digital signature by the way you send data.

## 13. What are the advantages & disadvantages of public key encryption?

Advantages:

a) Remove the restriction of a shared secret key between two entities. Here each entity can create a pair of keys, keep the private one, and publicly distribute the other one.

b) The no. of keys needed is reduced tremendously. For one million users to communicate, only two million keys are needed.

Disadvantage:

If you use large numbers the method to be effective. Calculating the cipher text using the long keys takes a lot of time. So it is not recommended for large amounts of text.

## 14. What are the advantages & disadvantages of secret key encryption?

Advantage:

Secret Key algorithms are efficient: it takes less time to encrypt a message. The reason is that the key is usually smaller. So it is used to encrypt or decrypt long messages.

Disadvantages:

a) Each pair of users must have a secret key. If N people in world want to use this method, there needs to be N (N-1)/2 secret keys. For one million people to communicate, a half-billion secret keys are needed.

b) The distribution of the keys between two parties can be difficult.

## 15. Define permutation.

Permutation is transposition in bit level.

*Straight permutation*: The no. of bits in the input and output are preserved.

*Compressed permutation*: The no. of bits is reduced (some of the bits are dropped). *Expanded permutation*: The no. of bits is increased (some bits are repeated).

## 16. Define substitution & transposition encryption?

*Substitution:* A character level encryption in which each character is replaced by another character in the set.

*Transposition:* A Character level encryption in which the characters retain their plaintext but the position of the character changes.

## 17. Define CGI?

. CGI is a standard for communication between HTTP servers and executable programs. It is used in crating dynamic documents.

## 18. What are the requests messages support SNMP and explain it?

□ GET□

SET

The former is used to retrieve a piece of state from some node and the latter is used to store a new piece of state in some node.

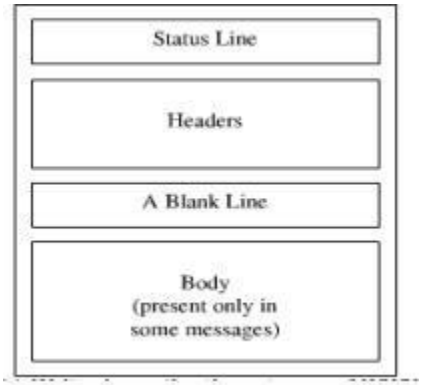
## 19. Define PGP?

Pretty Good Privacy is used to provide security for electronic mail. It provides authentication, confidentiality, data integrity, and non repudiation.

## 20. Define SSH?

Secure Shell is used to provide a remote login, and used to remotely execute commands and transfer files and also provide strong client/server authentication / message integrity.

## 21. Give the format of HTTP response message?




**22. What is the difference between service point address, logical address and physical address? Service point addressing Logical addressing Physical addressing**

| Service point addressing | Logical addressing | Physical addressing |
|---|---|---|
| The transport layer header includes a type of address called a service point address or port address, which makes a data delivery from a specific process on one computer to a specific process on another computer. | If a packet passes the network boundary we need another addressing to differentiate the source and destination systems. The network layer adds a header, which indicate the logical address of the sender and receiver. | If the frames are to be distributed to different systems on the network, the data link layer adds the header, which defines the source machine' s address and the destination Machine' s address. |

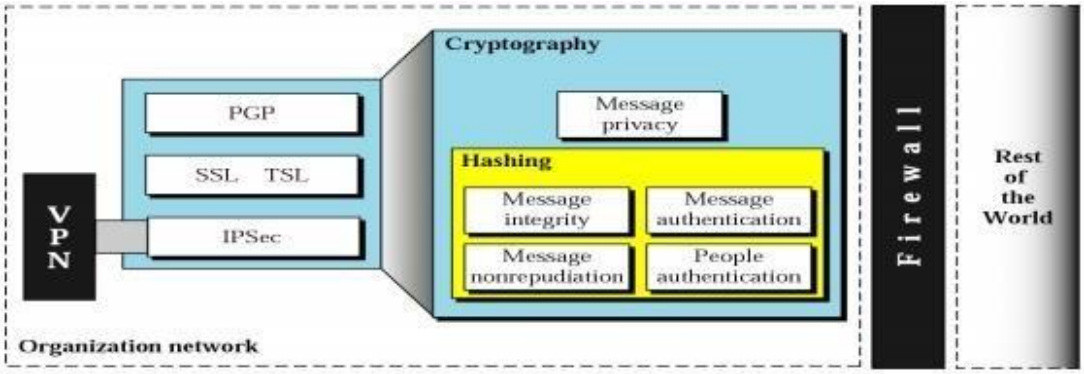
**21. Discuss the basic model of FTP.**

The client has three components: the user interface, the client control process, and the client data transfer process. The server has two components: the server control process and the server data transfer process. The control connection is made between the control processes. The data connection is made between the data transfer processes.

## 22. What is a digital signature?

Digital signature is a method to authenticate the sender of a message. It is similar to that of signing transactions documents when you do business with a bank. In network transactions, you can create an equivalent of an electronic or digital signature by the way you send data.

## 23. Draw the diagram foe explain security




**24. Define Cryptography**

- Cryptography refers to the science and art of transforming messages to make them secure and immune to attacks.
- Original message before being transformed is called **plaintext**.
- After the message is transformed, is called **ciphertext**.
- An encryption algorithm transforms the plaintext to ciphertext; a decryption algorithm transforms the ciphertext back to plaintext.
- The term cipher is used to refer to encryption and decryption algorithms.

## 25. What are the types of DNS Message

- Two types of messages

Query: header and question records

- Response: Header, question records, answer records, authoritative records, and additional records.

## 26. What is TELNET PROTOCOL?

A TELNET connection is a Transmission Control Protocol (TCP) connection used to transmit data with interspersed TELNET control information.

The TELNET Protocol is built upon three main ideas: first, the concept of a "Network

Virtual Terminal"; second, the principle of negotiated options; and third, a symmetric view of terminals and processes.

## 27. What is PGP?

Pretty Good Privacy. A program using public key encryption popularly used with email

A high security RSA public-key encryption application for MS-DOS, Unix, VAX/VMS, and other computers. It was written by Philip R. Zimmermann of Phil's Pretty Good(tm) Software and later augmented by a cast of thousands, especially including Hal Finney, BrankoLankester, and Peter Guttmann.

## 28. What is POP3?

POP3 (Post Office Protocol 3) is the most recent version of a standard protocol for receiving e-mail. POP3 is a client/server protocol in which e-mail is received and held for you by your Internet server. POP and IMAP deal with the receiving of e-mail and are not to be confused with the Simple Mail Transfer Protocol (SMTP), a protocol for transferring e-mail across the Internet.

## 29. What is IMAP.

IMAP (Internet Message Access Protocol) is a standard protocol for accessing e-mail from your local server. IMAP (the latest version is IMAP Version 4) is a client/server protocol in which e-mail is received and held for you by your Internet server.

IMAP can be thought of as a remote file server. POP3 can be thought of as a "store-and-forward" service.

## 30. What is SSH?

(**S**ecure **Sh**ell) A security protocol for logging into a remote server. SSH provides an encrypted session for transferring files and executing server programs. Also serving as a secure client/server connection for applications such as database access and e-mail SSH supports a variety of authentication methods.

## WORKED OUT PROBLEMS

**1. Calculate the total time required to transfer a 1.5MB file in the following cases,assuming a RTT of 80 ms, a packet size of 1 KB data, and an initial 2×RTT of"handshaking" before data is sent.**

(a)The bandwidth is 10Mbps, and data packets can be sent continuously.

The bandwidth is 10Mbps, but after we finish sending each data packet we must wait one RTT before sending the next.

The link allows infinitely fast transmit, but limits bandwidth such that only 20 packets can be sent per RTT.

Zero transmit time as in (c), but during the first RTT we can send one packet, during the second RTT we can send two packets, during the third we can send four = 23−1, and so on.

**SOLUTION**

We will count the transfer as completed when the last data bit arrives at its destination.

1.5 MB = 12,582,912 bits. 2 initial RTT's *(*160 ms*)* + 12,582,912/10,000,000 bps (transmit)+

RTT/2 (propagation) ≈ 1.458 seconds.

Number of packets required = 1.5 MB/1 KB = 1,536. To the above we add the time for 1,535 RTTs (the number of RTTs between when packet 1 arrives and packet 1,536 arrives), for a total of 1.458+122.8 = 124.258 seconds.

Dividing the 1,536 packets by 20 gives 76.8. This will take 76.5 RTTs (half an RTT for the first batch to arrive, plus 76 RTTs between the first batch and the 77th partial batch), plus the initial 2 RTTs, for 6.28 seconds.

Right after the handshaking is done we send one packet. One RTT after the handshaking we send two packets. At $n$ RTTs past the initial handshaking we have sent $1+2+4+\cdots+2n = 2n+1-1$ packets. At $n$= 10 we have thus been able to send all 1,536 packets; the last batch arrives 0.5 RTT later. Total time is 2 +10.5 RTTs, or 1 second.

**2. Consider a point-to-point link 50 km in length. At what bandwidth would propagation delay (at a speed of 2 × 108 m/sec) equal transmit delay for 100- byte packets? What about 512-byte packets?**

**SOLUTION :**

Propagation delay is 50 × 103 m/*(*2 × 108 m/sec*)* = 250 $\mu$s 800 bits/250 $\mu$s is 3.2 Mbits/sec. For 512-byte packets, this rises to 16.4 Mbit/sec.

**3. Suppose a 128-Kbps point-to-point link is set up between Earth and a rover on**

**Mars. The distance from Earth to Mars (when they are closest together) is approximately 55 Gm, and data travels over the link at the speed of light—3×108 m/sec.**

Calculate the minimum RTT for the link.

Calculate the delay × bandwidth product for the link.

A camera on the rover takes pictures of its surroundings and sends these to Earth. How quickly after a picture is taken can it reach Mission Control on Earth? Assume that each image is 5 MB in size.

**SOLUTION :**

(a) Propagation delay on the link is *(*55 × 109*)/(*3 × 108*)* = 184 seconds. Thus the RTT is 368 seconds.

The delay × bandwidth product for the link is = 184 × 128 × 103 = 2.81 MB.

After a picture is taken it must be transmitted on the link, and be completely propagated before Mission Control can interpret it. Transmit delay

for 5 MB of data is 41,943,040 bits/128×103 = 328 seconds. Thus, the total time required is transmit delay + propagation delay = 328 + 184 = 512 seconds.

## 4. Calculate the latency (from first bit sent to last bit received) for:

- A 1-Gbps Ethernet with a single store-and-forward switch in the path, and a packet size of 5,000 bits. Assume that each link introduces a propagation delay of 10 $\mu$s and that the switch begins retransmitting immediately after it has finished receiving the packet

Same as (a) but with three switches.

Same as (b) but assume the switch implements cut-through switching: it is able to begin retransmitting the packet after the first 128 bits have been received.

**SOLUTION :**

- For each link, it takes 1 Gbps/5 kb = 5 $\mu$s to transmit the packet on the link, after which it takes an additional 10 $\mu$s for the last bit to propagate across the link. Thus, for a LAN with only one switch that starts forwarding only after receiving the whole packet, the total transfer delay is two transmit delays + two propagation delays = 30 $\mu$s.

For three switched and thus four links, the total delay is four transmit delays + four propagation delays = 60 $\mu$s.

For “cut-through,” a switch need only decode the first 128 bits before beginning to forward.

This takes 128 ns. This delay replaces the switch transmit delays in the previous answer for a total delay of one Transmit delay + three cut-through decoding delays + four propagation delays =45.384 $\mu$s.

## 5. For the following, as in the previous problem, assume that no data compression is done. Calculate the bandwidth necessary for transmitting in real time:

HDTV high-definition video at a resolution of 1,920 × 1,080, 24 bits/pixel, 30 frames/sec.

Plain old telephone service (POTS) voice audio of 8-bit samples at 8 KHz.

GSM mobile voice audio of 260-bit samples at 50 Hz.

HDCD high-definition audio of 24-bit samples at 88.2 kHz.

**SOLUTION :**

□ 1,920×1,080×24×30 = 1,492,992,000 ≈ 1.5 Gbps.

8×8,000 = 64 Kbps.

260 ×50 = 13 Kbps.

24×88,200 = 216,800 ≈ 2.1 Mbps.

## 6. Show the 4B/5B encoding, and the resulting NRZI signal, for the following bit sequence:

1101 1110 1010 1101 1011 1110 1110 1111

**SOLUTION :**

The 4B/5B encoding of the given bit sequence is the following. 11011 11100 10110 11011 10111 11100 11100 11101

## 7 Suppose the following sequence of bits arrive over a link: 01101011111010100111111011001111110

Show the resulting frame after any stuffed bits have been removed. Indicate any errors that might have been introduced into the frame.

**SOLUTION :**

Let ∧ mark each position where a stuffed 0 bit was removed. There was one error where the sever consecutive 1s are detected (***err***). At the end of the bit sequence, the end of frame was detected (***eof*** ).

01101011111∧101001111111*err*0 110 01111110*eof*

Suppose we want to transmit the message 1011 0010 0100 1011 and protect it from errors using the CRC8 polynomial $x8 + x2 + x1 + 1$.

(a) Use polynomial long division to determine the message that should be transmitted.

(b) Suppose the leftmost bit of the message is inverted due to noise on the transmission link.

What is the result of the receiver's CRC calculation? How does the receiver know that an error has occurred?

**SOLUTION :**

□ We take the message 1011 0010 0100 1011, append 8 zeros and divide by 1 0000 0111 ($x8 + x2 + x1 + 1$). The remainder is 1001 0011. We transmit the original message with this remainder appended, resulting in 1011 0010 0100 0011 1001 0011.

(b) Inverting the first bit gives 0011 0010 0100 1011 1001 0011. Dividing by 1 0000 0111 ($x8 + x2 + x1 + 1$) gives aa remainder of 1011 0110.

Suppose you are designing a sliding window protocol for a 1-Mbps pointto-point link to the stationary satellite evolving around Earth at 3 × 104 km altitude. Assuming that each frame carries 1 KB of data, what is the minimum number of bits you need for the sequence number in the following cases? Assume

the speed of light is 3×108 meters per second.

(a) RWS=1.

(b) RWS=SWS.

**SOLUTION :**

One-way latency of the link is 100 msec. (Bandwidth) × (roundtrip delay) is about 125 pps×0.2 sec, or 25 packets. SWS should be this large.

If RWS = 1, the necessary sequence number space is 26. Therefore, 5 bitsare needed.

IfRWS = SWS, the sequence number space must cover twice the SWS, or up to 50. Therefore, 6 bits are needed.

**10. Given the extended LAN shown in Figure 3.34, assume that bridge B1 suffers catastrophic failure. Indicate which ports are not selected by the spanning tree algorithm after the recovery process and a new tree has been formed.**

**SOLUTION :**

The following list shows the mapping between LANs and their designated bridges. B1 dead[B7]

B2 A,B,D

B3 E,F,G,H

B4 I

B5 idle

B6 J

B7 C

11. **Suppose we have the forwarding tables shown in Table 4.13 for nodes A and F, in a network where all links have cost 1. Give a diagram of the smallest network consistent with these tables.**

A

| Node | Cost | NextHop |
|---|---|---|
| B | 1 | B |
| C | 1 | C |
| D | 2 | B |
| E | 3 | C |
| F | 2 | C |

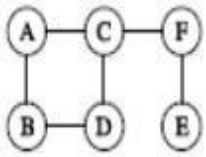
F

| Node | Cost | NextHop |
|---|---|---|
| A | 2 | C |
| B | 3 | C |
| C | 1 | C |
| D | 2 | C |
| E | 1 | E |

**Table 4.13 Forwarding tables for Exercise 19.**

**SOLUTION :**

The following is an example network topology.



**Part A/Unit 1**

**THE 8086 MICROPROCESSOR**

1 **What are the types of instruction sets of 8086 microprocessor?**

2 **What are flag manipulation instructions?**

3 **Explain the instructions LODS & STOS.**

4 **Define control transfer instruction & explain their types**.

5 **What are assembler directives? Give example.**

6 **What is the function of parity flag? (Nov 2013)**

7 **Define a MACRO.**

8 **Which interrupt has got the highest priority among all the external interrupts?**

9 **What are the segments registers present in 8086?**

10 **What do you mean by instruction pipelining?**

11 **What is the use of the Trap flag in the flag register of 8086?**

12 **List the instruction formats in 8086 instruction set.**

13 **What are the addressing modes of sequence control transfer instructions in 8086? Give example.(Apr/May 2018)**

14 **Give the operation of CBW and TEST instructions of 8086? (Nov 2013)**

15 **What do you mean by addressing modes? (May 2014)**

16 **How is the physical address generated in 8086? (or) How 16 bit address is converted into 20 bit address in 8086? (Nov 2013) (Apr/May 2017)**

17 **What are intersegment and intra segment modes of addressing?**

18 **Explain XLAT instruction.**

19 **Draw the PSW format for 8086.(May/June 2016)**

20 **Explain the function of TEST pin in 8086**

21 **What is meant by a vectored interrupt? (May 2014)**

22 **What are control transfer instructions?**

23 **Define a MACRO. (Nov/Dec 2017)**

24 **What are the advantages of the segmented memory scheme in 8086?**

25 **Write about the different types of interrupts supported in 8086. . (May 2015)**

26 **Define Stack. (May/June 2016) (Apr/May 2018)**

27 **List the modes of operation of 8086.(Nov/Dec 2017)**

28 **What is the need for interrupts in microprocessor operation?(Nov/Dec 2018)**

29 **What are Byte and String Manipulations? (Nov/Dec 2018)**

## PART B/ UNIT I

1 Discuss in detail the three types of interrupt system of Intel 8086/ Describe the interrupts of 8086 and its types with service routine **(May 2014) (Apr/May 2018)(Nov/Dec 2017)**

2 Explain the memory concepts of Intel 8086 and explain how data transfer takes place.

3 Describe the addressing modes 8086 with examples from instruction set of 8086.

**(Apr/May 2016)(Nov/Dec 2018)**

4 Write an 8086 ALP to find the sum of numbers in an array of 10 elements.(7)

**(Apr/May 2016)**

5 Write an 8086 ALP to logically shift a 16 bit number stored in location starting at 8000H twice to the right. Store the result in A000 H.

6 Explain the different instruction used for input and output operation in I/O mapped I/O mode of 8086.

7 Discuss in detail the hardware and software feature of 8086 interrupt structure.

**(Apr/May 2016)**

8 i) Write an 8086 ALP to sort out any given ten numbers in ascending and descending order. **(Nov 2013)**

ii) Give the functions of NMI, BHE and TEST pins of 8086. (4) **(Nov 2013)**

9 What is meant by memory segmentation? What are the advantages of memory segmentation?

10 i)Explain briefly about internal hardware architecture of 8086 microprocessor with a neat diagram.(10) (**Nov/Dec 2017**) (Apr/May 2018)

ii) Write a 8086 assembly language program to convert BCD data - Binary data.(6) **(May 2015)**

**(Apr/May 2017)**

11 i) Explain about ASSUME, EQU, DD assembler directives.(8)
**ii)** Explain briefly about interrupt handling process in 8086.(8) **(May 2015)**

12 For 8086 Microprocessor what are the instruction set and assembler directives?**(Nov/Dec 2018)**

## Part A/Unit II

## 8086 SYSTEM BUS STRUCTURE

1 **What is meant by multiprocessor system?**

2 **What is meant by multiprogramming? (Apr/May 2017)( Apr/May 2018)**

3 **What is closely coupled configuration?**

4 **What the advantages are of loosely coupled?**

5 **What is meant by cross bar switch?**

6 **Mention some network topologies?**

7 **Compare closely coupled and loosely coupled configurations. (Apr/May 2016)**

8 **Name some techniques for reducing contentions**

9 **What is meant by bus arbitration?**

10 **What are the advantages of Daisy Chaining?**

11 **What is meant by bus arbitration?**

12 **What is meant by Numeric processor?**

13 **On which data types can memory operands operate?**

14 **What is the use of TC STOP Mode?**

15 **What are advantages of coprocessor? (May 2014)**

16 **What is co-processor? (Nov 2013)**

17 **What is a Floating point Coprocessor? (Nov 2013)**

18 **What is meant by loosely coupled configuration? (May 2014) (Apr/May 2016)**

19 **Write some example for advanced processor. (Apr/May 2017)(Nov/Dec 2017)**

20 **Differentiate external vs. internal bus. (Apr/May 2016)**

21 **Define Bus. Why Bus request and cycle stealing are required? (May 2015)**

22 **Define system bus.(Nov/Dec 2018)**

23 **Draw the read cycle timing diagram for minimum mode. (May 2015)**

24 **What is the need of LOCK Signal? (Nov/Dec 2017)**

25 **When is co-processor used?(Nov/Dec 2018)**

26 **List two differences between maximum mode and minimum mode configuration of 8086.(Apr/May 2018)**

**Part B/Unit II**

1. How do you classify the instruction set of 8089 IOP?

2. Explain the instruction set of IOP Explain the bus interfacing controller used with Coprocessor.

3. Draw the functional block diagram of the I/O Processor (8089) and explain its working in the remote mode. **(Nov 2013) & (May 2014)**

4. Explain system bus structure and timings in 8086. **(Apr/May 2016.2017) (Nov/Dec 2017)(Nov/Dec 2018)**

5. What is a bus arbiter? Explain the functions of bus arbiter and briefly explain the addressing modes supported by 8089 I/O processor.

6. Write an 8086 assembly language program to get an input from the keyboard for 2 digits and i) Convert that input into a hexa decimal number using BIOS interrupt. (8) **(May 2014)**

   ii) Write an 8086 assembly language program to multiply 2 digit numbers by getting an input from the keyboard using BIOS interrupt call. (8)

7. Explain the execution steps of 8087 coprocessor. (8) **(May 2014) (Apr/May 2016)**

   Explain the closely coupled configuration of multi-processor configuration with Suitable diagram. **(May 2015) (Apr/May 2016) (Apr/May 2017)**
   Draw the pin details of 8086 and explain the function of each pin.

8. Discuss the maximum mode configuration of 8086 with a neat diagram. Mention the functions of various signals. (16) **(May 2015)(Apr/May 2018)**

9. Write an 8086 assembly language program to check whether the given string is palindrome.

10. Explain the following: **(Apr/May 2016)**

Multiprogramming

Semaphore

11. Draw the timing diagram for interrupt acknowledgement cycle **(Apr/May 2017)(Nov/Dec 2017)**

12 Explain the loosely coupled configuration of multi-processor configuration with suitable diagram**(Nov/Dec 2017)**

13 Discuss about the multiprocessor configurations of 8086**.(Apr/May 2018)**

14 Distinguish between closely coupled and loosely coupled multiprocessor configurations.**(Nov/Dec 2018)**

**Part A/ Unit III**

**I/O INTERFACING 9**

1 **Name the Command word to set bit PC, using BSR mode.**

2 **Why the 8255A is designed so that only the bits in PORT C can be set/reset?**

3 **What is key bouncing? (Apr/May 2016)**

4 **What is the use of BSR mode in 8255**

5 **List the advantages and disadvantages of parallel communication over serial communication. (Apr/May 2016)**

6 **How many I/O devices with a word length of 1 bit can be connected to 8255 PPI**

7 **How does 8255 PPI discriminate between the memory section data and I/O section data**

8 **What is the function of STB and OBF signal in the 8255 when programmed for mode –1 operation?**

9 **Name the major block of 8259 Programmable Interrupt Controller.**

10 **What are the modes of operation of 8259 Interrupt Controller?**

11 **What is the maximum number of devices that can be connected to interrupt mode**

12 **Mention the function of SP/EN signal in the 8259 PIC.**

13 **Why CAS2-CAS0 lines on 8259 PIC are bi-directional?**

14 **What is the use of address enable (AEN) pin of 8257 DMA Controller?**

15 **What is the use of the READY input of the DMA controller?**

16 **What is the purpose of the IC 8257?**

17 **What are TC and MARK signal in a DMA controller?**

18 **List the four possible modes of operation in 8237 DMA controller.**

19 **What is an USART?**

20 **What are the operating modes of 8255? (Nov/Dec 2013)**

21 **List the features of Memory Mapped I/O. (May/Jun 2014)**

22 **What is bus stealing? (Nov/Dec 2013)**

23 **What are the advantages of Programmable Interval Timer/Counter IC? (May/Jun 2014)**

24 **Give the Various modes and Applications of 8254. (May/Jun 2015)(Apr/May 2018)**

25 **Draw the format of read back command register of 8254. (Apr/May 2017)**

26 **What is meant by Direct Memory Access?**

27 **What is meant by control register?**

28 **What are the differences between LED display and LCD display?(Nov/Dec 2018)**

29 **Write a 16 bit delay program in 8086 (Apr/May 2018)**

30 **What are the handshake signals used in Mode – 2 configuration of 8255? (Nov/Dec 2017)**

31 **How DMA operation is performed with 8086. (Nov/Dec 2017)**

32 **Why is memory interfacing required?(Nov/Dec 2018)**

**Part B/Unit III**

**1** **With a block diagram of internal structure of 8255 PPI and explain the functions of each block Illustrate the 8255 mode 1 output and input port timings. (Apr/May 2017)**

**2** **With a neat block diagram explain the function of each block of a programmable interrupt controller. (Nov/Dec 2018)**

**3** **Draw the block diagram of DMA controller IC and explain the function of each block. (May 2015) & (May 2014) (Apr/May 2016) (Apr/May 2017)(Nov/Dec 2018)**

**4** **With a block schematic explain how a (4x4) matrix hex keyboard can be interfaced to a CPU using 8279 keyboard display controller? (Nov 2013)(Nov/Dec 2017)(Apr/May 2018)**

**5** **Interface a D/A converter and A/D convertor with a microprocessor. Explain with a Program, how to generate a sine wave using this. (May 2015)(Nov/Dec 2018)**

**6** **Describe with MODE 0 and MODE 3 configurations of 8254 timer in detail.(8)**

**(ii) Draw and explain the operation of a sample and hold circuit. (4)**

**(iii) Show the control word format of 8255 and explain how each bit is**

**programmed.(4)**

**7** **(i) Explain the mode 0 operation of 8255 Programmable Peripheral interface. (8) (May 2014)**

**(ii) Explain the different modes of operation of timer. (8)**

**8** **(i) Bring about the features of 8251. (6) (Nov 2013)**

**(ii) Discuss how 8251 is used for serial data communication. (6)**

**(iii) Explain the advantages of using the USART chips in microprocessor based systems. (4)**

**9** **Draw and explain the block diagram of alarm controller. (Apr/May 2016)(Apr/May 2018)**

**10** **Explain design of Traffic Light Controller using 8086 microprocessor in detail. Write the algorithm and ALP for traffic light control system. (May 2015)(Apr/May 2018)**

**11** **Draw and explain the functional diagram of 8251.(Nov/Dec 2017)(Apr/May 2018)**

# IT8501-WEB TECHNOLOGY IMPORTANT QUESTIONS

## UNIT-I

### 1. Define Protocol?

A protocol is a precise set of rules defining how components communicate, the format of addresses, how data is split into packets

### 2. List out the basic Internet Protocols.

TCP/IP, POP3, MIME, IMAP

### 3. Define TCP.

TCP Transmission Control Protocol is a standard that defines how to establish and maintain a network conversation via which application programs can exchange data. TCP works with the Internet Protocol (IP), which defines how computers send packets of data to each other.

### 4. Define the function of TCP/IP?

TCP is one of the main protocols in TCP/IP networks the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

### 5. Define UDP?

UDP (User Datagram Protocol) is an alternative protocol to TCP that also builds on IP. it does not provide the two-way connection or guaranteed delivery of TCP. Its advantage over TCP is speed for simple tasks

### 6. What is DNS and its functions?

DNS stands for Domain Name System. Every device on the Internet has an IP address

such as 192.0.34.166 etc , humans generally find it easier to refer to machines by names, such as www.example.org etc.The main function of DNS is to translate domain names into IP Addresses, which computers can understand. It also provides a list of mail servers which accept Emails for each domain name.

### 7..Define HTTP

Hypertext transfer protocol is a form of communication protocol, it indicates detailed specification of how web clients and servers should communicate. The basic structure of HTTP communication follows what is known as a request–response model. HTTP interaction is initiated by a client sending a request message to the server,the server is then expected to generate a response message

### 8. What is the structure of HTTP Request Message?

- *start-line* describing the requests to be implemented, or its status of whether successful or a failure. This start-line is always a single line.
- An optional set of *HTTP headers* specifying the request, or describing the body included in the message.
- A blank line indicating all meta-information for the request have been sent.
- An optional *body* containing data associated with the request (like content of an HTML form), or the document associated with a response. The presence of the body and its size is specified by the start-line and HTTP headers

### 9.What is the structure of HTTP Response Message?

A simple response from the server contains the following components:

- HTTP Status Code
- Headers (Example – Content-Type: html)
- An empty line.
- A message body which is optional.

### 10. What is Cache?

Browsers often cache (save on disk) web pages so they can quickly reload the pages. If there are no changes between the last version stored in the cache and the current version on the Web, this helps speed up your browsing experience.

### 11. Define URL.

URL stands for Uniform Resource Locator, and is used to specify addresses on the World Wide Web. A URL is the fundamental network identification for any resource connected to the web (e.g., hypertext pages, images, and sound files). The protocol specifies how information from the link is transferred.

### 12. what is a relative URL?

A **relative URL** is any **URL** that doesn't explicitly specify the protocol (e.g., " http:// " or " https:// ") and/or domain ( www.example.com ), which forces the visitor's web browser to assume it refers to the same site on which the **URL** appears

### **13.** What is HTML?

Hypertext is ordinary text that has been designed with extra features such as formatting, images, multimedia and links to other documents. Markup is the process of taking ordinary text and adding extra symbols. Each of the symbols used for markup in HTML is a command that tells a browser how to display the text. HTML is the technical term for the format used to create normal web pages.

### 14. What are the types of list supported by HTML?

There are three types of list supported by

HTML. Unordered – A bullet list

Ordered – a number list and Definition – A list of terms and definitions for each

### 15. Discuss about comments in HTML.

A comment in HTML, like comments in other computer languages, is something that is intended to be read by the programmers but to be ignored by the software processing the document. A comment begins with the string of characters <!—which must contain no whitespace. A comment ends with the string --> again with no white space.<!-- Single line Comment Multi line Comments -->

### 16. What are character references?

This reference are second type of reference for each symbol in an HTML document and begins with a number sign which follows the ampersand beginning the reference and is followed by the Unicode Standard value of the character. E.g. < , ñ , α.

### 17. What are entity references?

A reference which uses a mnemonic name for the character references in the HTML document always begins with ampersand (&) and ends with semicolon (;) is called an entity reference. E.G.  , " < > ETC.

### 18. What is the use of DTD?

The <!DOCTYPE> declaration is not an HTML tag; it is an instruction to the web browser about what version of HTML the page is written in. there are three *flavors* of both the HTML 4.01 and XHTML 1.0 specifications

(i) Strict -This DTD contains all HTML elements and attributes, but does NOT INCLUDE presentational or deprecated elements (like font). Framesets are not allowed.

(ii)Transitional-This DTD contains all HTML elements and attributes, INCLUDING presentational and deprecated elements (like font). Framesets are not allowed.

(iii) Frameset-This DTD is equal to HTML 4.01 Transitional, but allows the use of frameset content.

### 19. What are HTTP Status Codes?

This code provides the information about the HTTP Response from the server. All status code is three-digit decimal numbers. The first digit represents the general class of status code.

The last two digits of a status code define the specific status within the specified class.

### 20. What are the types of Entity Declarations?

XML DTD can contain entity declarations each of which begins with the keyword ENTITY followed by an entity name and its replacement text such as

<!ENTITY GT ">"> Types of Entities are i) General Entities ii) Parameter Entities iii) External Entities

### 21. What are attribute list declarations?

An attribute list declaration is included in the DTD for each element that has attributes and its declaration begins with the keyword ATTLIST followed by an element type name and specifies the names for all attributes of the named element, the type of data that can be used as the value of each attribute, and default value information.

### 22. Define Web Clients.

A Web Client is software that accesses a web server by sending an HTTP request message and processing the resulting HTTP response.

### 23. What are Web Servers?

A Web Server is software that accepts HTTP requests from web clients and returns an appropriate resource in the HTTP response.

### 24. What are Secure Servers?

The standard means of indicating to a browser that it should encrypt an HTTP request is to use the *https* scheme on the URL for the request. For e.g. *https://www.example.org* will cause the browser to attempt to send an encrypted HTTP GET request.

### 25 List out the types of attribute list declarations?

NMTOKEN- Name

token ID -Identifier

IDREF -Identifier Reference IDREFS Identifier Reference list CDATA-

Character Data PCDATA- Parsed Character Data

### 26. What is #PCDATA?

The keyword #PCDATA (—Parsed Character Data‖) used in defining the character data and mixed content types represent any string of characters excluding less-than andampersand, which are included because they represent the start characters for markup.

### 27. List out the available HTTP methods.

GET, HEAD, POST, OPTIONS, PUT, DELETE, TRACE

**UNIT-II**

**1. What are Style Sheets?**

Style sheets are collections of style information that are applied to plain text. Style information includes font attributes such as type size, special effects (bold,italic,underline), color and alignment. Style sheets also provide broader formatting instructions by specifying values for quantities such as line spacing and left and right margins.

**2. List down the ways of including style information in a document.**

(i) 1.Linked Styles -Style information is read from a separate file that is specified in the <LINK> tag

(ii) 2.Embedded Styles -Style information is defined in the document head using the <STYLE> and </STYLE> tags.

(iii) 3.Inline Styles -Style information is placed inside an HTML tag and applies to all content between that tag and it companion closing tag

**3. Define cascading.**

Cascading refers to a certain set of rules that browsers use, in cascading order, to determine how to use the style information. Such a set of rules is useful in the event of conflicting style information because the rules would give the browser a way to determine which style is given precedence

**4. List down font characteristics permitted in style sheets.**

i. 1.font-family
ii. 2.font-size
iii. 3.font-weight
iv. 4.font-style
v. 5.font-variant

**5.Mention the advantages of java/java script**

a. Use sending data continuously File storage
b. Massively parallel computing
c. Smart forms – includes various controls like text box, radio button, text area control etc.

d. Peer-to-Peer Interaction – used in various client/server model.
e. Games – Combine the ability to easily include networking in your programs with java‟s powerful graphics and you have the recipe for truly awesome multiplayer games.
f. Chat – Used in various chat applications.
g. Whiteboards – Java programs are not limited to sending ext and data across the network.

h. A number of programmers have developed whiteboard software that allows users in diverse locations to draw on their computers

**6.**Give example for inline style sheet.

An internal style sheet may be used if one single page has a unique style.

Internal styles are defined within the <style> element, inside the <head> section of an HTML page:

```
<head>
<style>
body {
  background-color: linen;
}
h1 {
  color: maroon;
  margin-left: 40px;
}
</style>
</head>
```

**7.**How external style sheet is useful in web page design?

With an external style sheet, we can change the look of an entire website by changing just one file!Each page must include a reference to the external style sheet file inside the <link> element. The <link> element goes inside the <head> section:

```
<head>
<link rel="stylesheet" type="text/css" href="mystyle.css">
</head
```

**8.** Write short notes on text properties in CSS with suitable example

### Text properties of an element –

(i) The **color** property is used to set the color of a text.

(ii) The **direction** property is used to set the text direction.

(iii) The **letter-spacing** property is used to add or subtract space between the letters that make up a word.

(iv) The **word-spacing** property is used to add or subtract space between the words of a sentence.

(v) The **text-indent** property is used to indent the text of a paragraph.

(vi) The **text-align** property is used to align the text of a document.

**9.** What is Normal Flow Box Layout in CSS?

In the normal flow, text elements are laid out from top to bottom, and from left to right in left-to-right reading languagesThis is the default behavior of the web browser.

10 Give the syntax of a CSS rule.

**Selectors**

Any HTML element is a possible CSS1 selector. The **selector** is simply the element that is linked to a particular style. For example, the selector in

```
P { text-indent: 3em }
```

### Declarations Properties

A **property** is assigned to a selector in order to manipulate its style. Examples of properties include color, margin, and font**.**

11. What is meant by DHTML?

Dynamic Hyper Text Markup Language (**DHTML**) is a combination of Web development technologies used to create dynamically changing websites. Web pages may include animation, dynamic menus and text effects. The technologies used include a combination of HTML, JavaScript or VB Script, CSS and the document object model (DOM).

12. List the ways of positioning an element within a browser window.

The position property specifies the type of positioning method used for an element (static, relative, absolute, fixed, or sticky).

Static Default value. Elements render in order, as they appear in the document flow

Absolute: The element is positioned relative to its first positioned (not static)

ancestor element

Fixed :The element is positioned relative to the browser window

Relative: The element is positioned relative to its normal position, so "left:20px" adds 20 pixels to the element's LEFT position

13 What is a JavaScript statement? Give an example.

JavaScript statements are composed of:Values, Operators, Expressions, Keywords, and Comments.

Example :This statement tells the browser to write “HELLO WORLD”

inside an HTML element with id="demo

document.getElementById("demo").innerHTML = "Hello WORLD";

14. Explain array creation in JavaScript with example.

An array is a special variable, which can hold more than one value at a time.If you have a list of items (a list of car names, for example), storing the cars in single variables could look like this:

EXAMPLE

```
var car1 = "Saab";
var car2 = "Volvo";
var car3 = "BMW";
```

Creating an Array

Using an array literal is the easiest way to create a JavaScript Array.

Syntax: var *array_name* = [*item1*, *item2*, ...];

15 List the different methods defined in document and window object of JavaScript.

The window object represents a window in browser. An object of window is created automatically by the browser. Window is the object of browser, it is not the object of javascript. The javascript objects are string, array, date etc

(i) alert()displays the alert box containing message with ok button.
(ii) confirm()displays the confirm dialog box containing message with ok and cancel button. prompt()displays a dialog box to get input from the user
(iii) open()opens the new window
(iv)close()closes the current window
(v) setTimeout()performs action after specified time like calling function, evaluating expressions etc.

16.List and explain any two JavaScript built in objects..

JavaScript sports a number of built-in objects that extend the flexibility of the language.

These objects are Date, Math, String, Array, and Object

Math Object:Math object is a built-in static object.It is used for performing complex math

operations SQRT2 -Returns square root of 2,PI-Returns Π value.

17 State the types of JavaScript statements with examples

JavaScript statements can be grouped together in code blocks, inside curly brackets {...}.

The purpose of code blocks is to define statements to be executed together.One place you will find statements grouped together in blocks, is in JavaScript functions

```
function myFunction() {
 document.getElementById("demo1").innerHTML = "Hello
 WORLD"; document.getElementById("demo2").innerHTML =
 "How are you?";
}
```

JavaScript statements often start with a **keyword** to identify the JavaScript action to be performed. Example BREAK, CONTINUE

18.Write the JavaScript to print “Good Day” using IF-ELSE condition

```
if (hour < 18) {
 greeting = "Good day";
} else {
 greeting = "Good evening";
}
```

19Write code to return the full URL of a document.

The URL property returns the full URL of the current HTML document.

**Note:** This property is similar to the location.href property.

```
var x = document.URL;
```

20 Compile the limitations of CSS.

It has various limitations as a programming language, a few of them are as follows:

(i) it cannot perform any logical operations like if/else, for/while, +/-, etc.
(ii) You cannot read your files using CSS.
(iii)Unable to interact with databases.
(iv)CSS can't request a web page.

20.Apply CSS to a web page with the following requirements Add a background image of a submarine.

The background-image property specifies an image to use as the background of an element.By default, the image is repeated so it covers the entire element. The background image for a page can be set like this:

```
        body {
 background-image: url("submarine.gif");
}
```

**UNIT-III**

**1. Define host objects**

**Host objects** are objects that are supplied to JavaScript by the browser environment.

Examples of these are window, document, forms, etc.

**2. List the types of event listeners in DOM2.**

A full list is available in MDN, but here are some of the most common event types and event names:

(i) mouse **events** ( MouseEvent ): mousedown, mouseup, click, dblclick, mousemove, mouseover, mousewheel, mouseout, contextmenu.

(ii) touch **events** ( TouchEvent ): touchstart, touchmove, touchend, touchcancel.

**3. Assess Event Bubbling and Event Capturing**.

Bubbles Event Property

The bubbles event property returns a Boolean value that indicates whether or not an event is a bubbling event. Event bubbling directs an event to its intended target, .A button is clicked and the event is directed to the button, If an event handler is set for that object, the event is triggered .If no event handler is set for that object, the event bubbles up (like a bubble in water) to the objects parent

**4.What is meant by event handling?**

HTML Events-An HTML event can be something the browser does, or something a user does.
Here are some examples of HTML events:

An HTML web page has finished loading

- An HTML input field was changed
- An HTML button was clicked

Often, when events happen, you may want to do something. JavaScript lets you execute code when events are detected.HTML allows event handler attributes, **with JavaScript code**, to be added to HTML elements.

**5. List and explain any four HTML intrinsic event attributes**.

Intrinsic event handlers

ONLOAD (Script)

This event occurs when the browser finishes loading a document or a all frames in a frameset. It applies to BODY and FRAMESET elements.

ONUNLOAD (Script)

This event occurs when the browser stops displaying a document or a frame. It applies to BODY and FRAMESET elements.

ONCLICK (Script)

This event occurs when a mouse button is clicked over an element.

ONDBLCLICK (Script)

This event occurs when a mouse button is double-clicked over an element.

**6. Evaluate the various levels of DOM.**

**Level** 0

supports an intermediate **DOM**, which exists before the creation of **DOM Level1**

**Level**1 is an API that allows program and scripts to dynamically access and update the content, structure, and style of HTML and XML 1.0 documents

## 7. Examine the usage of DOM style property.

The style property returns a CSSStyleDeclaration object, which represents an element's style attribute.

The style property is used to get or set a specific style of an element using different CSS properties.

**Note:** It is not possible to set styles by assigning a string to the style property, e.g. *element*.style = "color: red;". To set the style of an element, append a "CSS" property to style and specify a value, like this: *element*.style.backgroundColor = "red"; // set the background color of an element to redTry it

**8. List some of the window object properties.**

## Window Object

The window object represents an open window in a browser.If a document contain frames (<iframe> tags), the browser creates one window object for the HTML document, and one additional window object for each frame. closed Returns a Boolean value indicating whether a window has been closed or not

(i) console Returns a reference to the Console object, which provides methods for logging information to the browser's console

**9-Compose any two mouse events.**

mousedown The event occurs when the user presses a mouse button over an element

mouseenter The event occurs when the pointer is moved out of an element

mousemove The event occurs when the pointer is moving while it is over an element

**10. Discuss any two keyboard events**

## Definition and Usage

The onkeypress event occurs when the user presses a key (on the keyboard).
The order of events related to the onkeypress event:

onkeydown-Execute a JavaScript when a user is pressing a key

<input type="text" onkeydown="myFunction()">

Onkeypress

1. onkeyup

   Execute a JavaScript when a user releases a key:

```
<input type="text" onkeyup="myFunction()">
```

**11. Differentiate Client Side Scripting from Server Side Scripting.**

**Client-side Environment**

The client-side environment used to run scripts is usually a browser. The processing takes place on the end users computer. The source code is transferred from the web server to the users computer over the internet and run directly in the browser.

Server-side Environment

The server-side environment that runs a scripting language is a web server. A user's request is fulfilled by running a script directly on the web server to generate dynamic HTML pages. This HTML is then sent to the client browser. It is usually used to provide interactive web sites that interface to databases or other data stores on the server.

**12.** rite a short note on java servlet life cycle.

Servlet life cycle can be defined as the entire process from its creation till the destruction. The following ar s followed by a servlet.

(i) The servlet is initialized by calling the **init()** method.

(ii) The servlet calls **service()** method to process a client's request.

(iii) The servlet is terminated by calling the **destroy()** method.

(iv) Finally, servlet is garbage collected by the garbage collector of the JVM.

**13. List the different life cycle methods of Java Servlets.**

**Here are the five steps of servlet life cycle.**

Step 1: Loading of **Servlet**. When the web server (e.g. Apache Tomcat) starts up, the **servlet** container deploy and loads all the **servlets**. Step 2: Creating instance of **Servlet**. ...

Step 3: Invoke init() **method**. ...

Step 4: Invoke service() **method**. ...

Step 5: Invoke destroy() **method**

**14. What is a cookie?**

Cookies are small files which are stored on a user's computer. They are designed to hold a modest amount of data specific to a particular client and website, and can be accessed either by the web server or the client computer. This allows the server to deliver a page tailored to a particular user, or the page itself can contain some script which is aware of the data in the cookie and so is able to carry information from one visit to the website (or related site) to the next.

**15. Write the purpose of URL rewriting.**

1. It will always work whether cookie is disabled or not (browser independent).
2. Extra form submission is not required on each pages.

**16. How is session tracking achieved by URL rewriting?**

If your browser does not support cookies, URL rewriting provides you with another session trac alternative. URL rewriting is a method in which the requested URL is modified to include a sessio **url?name1=value1&name2=value2&??**

We can send parameter name/value pairs using the following format name and a value is separated usin equal = sign, a parameter name/value pair is separated from another parameter using the ampersand(&). When the clicks the hyperlink, the parameter name/value pairs will be passed to the server. From a Servlet, we can getParameter() method to obtain a parameter value.

**17. What is ServletContext object**

An object of ServletContext is created by the web container at time of deploying the project. This object can be used to get configuration information from web.xml file. There is only one ServletContext object per web application.

**18. State the use of ServletContext object**

(i) There can be a lot of usage of ServletContext object. Some of them are as follows:

(ii) The object of ServletContext provides an interface between the container and servlet.

(iii) The ServletContext object can be used to get configuration information from the web.xml file.

(iv) The ServletContext object can be used to set, get or remove attribute from the web.xml file.

(v) The ServletContext object can be used to provide inter-application communication.

**19. What is a servlet**

Servlet can be described in many ways, depending on the context.

(i) Servlet is a technology which is used to create a web application.

(ii) Servlet is an API that provides many interfaces and classes including documentation.

(iii) Servlet is an interface that must be implemented for creating any Servlet.

(iv) Servlet is a class that extends the capabilities of the servers and responds to the incoming requests. It can respond to any requests.

(v) Servlet is a web component that is deployed on the server to create a dynamic web page.

**20. What is a web container**

web container (also known as a servlet container) is essentially the component of a web server that interacts with the servlets. The web container is responsible for managing the lifecycle of servlets, mapping a URL to a particular servlet and ensuring that the URL requester has the correct access rights

## 21. Identify the difference between get request and post request type.

| Features | **GET** | POST |
|---|---|---|
| **BACK button/Reload** | Harmless | Data will be re-submitted (the browser should alert the user that the data are about to be re-submitted) |
| **Bookmarked** | Can be bookmarked | Cannot be bookmarked |
| **Cached** | Can be cached | Not cached |

## Unit-IV

### 1. Give the advantages of using JSP for server side programming

JavaServer Pages often serve the same purpose as programs implemented using the **Common Gateway Interface (CGI)**. But JSP offers several advantages in comparison with the CGI.Performance is significantly better because JSP allows embedding Dynamic Elements in HTML Pages itself instead of having separate CGI files.

JSP are always compiled before they are processed by the server unlike CGI/Perl which requires the server to load an interpreter and the target script each time the page is requested.

JavaServer Pages are built on top of the Java Servlets API, so like Servlets, JSP also has access to all the powerful Enterprise Java APIs, including **JDBC, JNDI, EJB, JAXP,** etc.

### 2. Write two basic differences between JSP and servlet.

| S.No | JSP | Servlet |
|---|---|---|
| 1 | JSP is an interface on top of Servlets. In another way, we can say t JSPs are extension of servlets to minimize the effort of developer write User Interfaces using Java programming | A servlet is a server-side program and written purely on Java. |
| 2 | JSP runs slower because it has the transition phase for converting from JSP page to a Servlet file. Once it is converted to a Servlet then it will start the compilation | Servlets run faster than JSP |

3. List the types of directives in JSP.

**Directive Tag** gives special instruction to Web Container at the time of page translation. Directive tags are of three types: **page**, **include** and **taglib**

4. Define page directive

**Page directive** defines a number of page dependent properties which communicates with the Web Container at the time of translation. Basic syntax of using the page directive is <%@ page attribute="value" %>

5. Define include directive

Include Directive

The *include* directive tells the Web Container to copy everything in the included file and paste it into current JSP file. Syntax of **include** directive is

<%@ include

file=”filename.jsp”%> 6.Explain in brief

about Java Scriplet.

Scriptlet tag allows to write Java code into JSP file. JSP container moves statements in _jspservice() method while generating servlet from jsp. For each request of the client, service method of the JSP gets invoked hence the code inside the Scriptlet executes for every request

7. Display current date using Java Scriplet.

<%@ page import = "java.io.*,java.util.*, javax.servlet.*" %>

```
<html>
<head>
<title>Display Current Date & Time</title>
</head>
<body>
<center>
<h1>Display Current Date & Time</h1>
</center>
<%Date date = new Date();
out.print( "<h2 align = \"center\">" +date.toString()+"</h2>");
%>
</body>
</html>
```

OUTPUT

Display Current Date & Time

Mon Jun 21 21:46:49 2019

8. What is MVC paradigm?

MVC Pattern stands for Model-View-Controller Pattern. This pattern is used to separate application's concerns

.**Model** - Model represents an object or JAVA POJO carrying data. It can also have logic to update controller if its data changes.

**View** - View represents the visualization of the data that model contains.

**Controller** - Controller acts on both model and view. It controls the data flow into model object and updates the view whenever data changes. It keeps view and model separate

9. Write short notes on some implicit objects in JSP.

These **Objects are** the Java **objects** that the **JSP** Container makes available to the developers in each page and the developer **can** call them directly without being explicitly declared. **JSP Implicit Objects are** also called pre-defined variables.

10. whatarethesteps followedByJSP

The following are the paths followed by a JSP −

i. Compilation
ii. Initialization
iii. Execution
iv. Cleanup

11. Define JSP Initialization

JSP Initialization

When a container loads a JSP it invokes the **jspInit()** method before servicing any requests. If you need to perform JSP-specific initialization, override the **jspInit()** method initialization is performed only once and as with the servlet init method, you generally initialize database connections, open files, and create lookup tables in the jspInit method.

```
public void jspInit(){
        // Initialization code...
        }
```

12.Explain JSTL?

The JavaServer Pages Standard Tag Library (JSTL) is a collection of useful JSP tags which encapsulates the core functionality common to many JSP applications. JSTL has support for common, structural tasks such as iteration and conditionals, tags for manipulating XML documents, internationalization tags, and SQL tags. It also provides a framework for integrating the existing custom tags with the JSTL tags.

13.What is the purpose of namespace?

XML Namespace is a mechanism to avoid name conflicts by differentiating elements or attributes within an XML document that may have identical names, but different definitions. We will be

covering the basics of namespace, including declaration methods, scope, attribute namespace, and default namespace

14.What is a DTD?

A DTD is a Document Type Definition. A DTD defines the structure and the legal elements and attributes of an XML document. With a DTD, independent groups of people can agree on a standard DTD for interchanging data. An application can use a DTD to verify that XML data is valid.

15.What is an XPATH?

XPath is a major element in the XSLT standard. It can be used to navigate through elements and attributes in an XML document.

XPath is a syntax for defining parts of an XML document

XPath uses path expressions to navigate in XML documents

XPath contains a library of standard functions

16.List the advantages of XPATH. Xpath advantages

Benefits of XPath. XPath is designed for XML documents. It provides a single syntax that you can use for queries, addressing, and patterns. XPath is concise, simple, and powerful

Queries are compact.

Queries are easy to type and read.

Syntax is simple for the simple and common cases

17.What is SAX in XML parsing

SAX (Simple API for XML) is an event-based parser for XML documents. Unlike a DOM parser, a SAX parser creates no parse tree. SAX is a streaming interface for XML, which means that applications using SAX receive event notifications about the XML document being processed an element, and attribute, at a time in sequential order starting at the top of the document, and ending with the closing of the ROOT element.

18.Difference between DOM and SAX XML Parser

Here are few high-level differences between DOM parser and SAX Parser in Java:

DOM parser loads whole XML document in memory while SAX only loads a small part of the XML file in memory.DOM parser is faster than SAX because it access whole XML document in memory.

SAX parser in Java is better suitable for large XML file than DOM Parser because it doesn't require much memory.DOM parser works on Document Object Model while SAX is an event based XML parser.

19. What is the purpose of XSLT ?

XSL Transformations (XSLT) is a standard way to describe how to transform (change) the structure of an XML (Extensible Markup Language) document into an XML document with a different structure. XSLT is a Recommendation of the World Wide Web Consortium XSLT is used to describe how to transform the *source tree* or data structure of an XML document into the *result tree* for a new XML document, which can be completely different in structure. The coding for the XSLT is also referred to as a style sheet and can be combined with an XSL style sheet or be used independently.

20.Discuss CDATA and PCDATA.

CDATA: (Unparsed Character data): CDATA contains the text which is not parsed further in an XML document. Tags inside the CDATA text are not treated as markup and entities will not be expanded.

PCDATA: PCDATA: (Parsed Character Data): XML parsers are used to parse all the text in an XML document. PCDATA stands for Parsed Character data. PCDATA is the text that will be parsed by a parser. Tags inside the PCDATA will be treated as markup and entities will be expanded.

## UNIT -V

1. Explain AJAX.

AJAX means Asynchronous JavaScript and XML. it is a technique for creating fast and dynamic web pages. AJAX allows web pages to be updated asynchronously by exchanging small amounts of data with the server behind the scenes. This means that it is possible to update parts of a web page, without reloading the whole page.

2. Identify the advantages of AJAX.

### Advantages of AJAX

(i) Reduce the traffic travels between the client and the server.
(ii) Response time is faster so increases performance and speed
(iii) Ready Open source JavaScript libraries available for use – JQuery, Prototype, Scriptaculous, etc..
(iv) AJAX communicates over HTTP Protocol

3. Analyze the disadvantages of AJAX.

(i) It can increase design and development time
(ii) More complex than building classic web application
(iii) Security is less in AJAX application as all files are downloaded at client side.
(iv) Search Engine like Google cannot index AJAX pages.
(v) JavaScript disabled browsers cannot use the application

4. Identify the technologies used by AJAX.

**Following technologies are used in Ajax.**

(i) HTML/XHTML and CSS. These technologies are used for displaying content and style.
(ii) DOM. It is **used** for dynamic display and interaction with data.
(iii) XML or JSON. For carrying data to and from server. ...
(iv) ASP or JSP used in Server side.
(v) XMLHttpRequest. For asynchronous communication between client and server
(vi) JavascriptI t used for Client-side validation and validate user input in an HTML form before sending the data to a server

5. List all the features of AJAX.

**Important Features of Ajax**

(i) User Frendly.

(ii) It make web page faster.

(iii) Independent of server technology.

(iv) Increase the Performance of web page.

(v) Support for Live data binding.

(vi) Support for the Data View control.

(vii) Support for Client-side template rendering.

(viii) Rich and, responsive user interfaces

6. Compare AJAX and JavaScript?

JavaScript is a client-side script, used to control a web page at the client side once it has downloaded. The validations in case of JavaScript will be handled particularly on client's browser and no server side requests will be handled. AJAX allows JavaScript to communicate with the remote script and receive the response from the server, without the need to reload the entire page. JavaScript is the base on which Ajax works

7. Create an AJAX object.

**AJAX uses** the following syntax to

create an object: var myobject = new

AjaxObject("page path");

The page path is the URL of the Web page containing the object that you want to call. The URL must be of the same domain as the Web page.

8. What is a XML HttpRequest object?

## The XMLHttpRequest Object

The XMLHttpRequest object can be used to request data from a web server.

Update a web page without reloading
the page Request data from a server -
after the page has loaded Receive data
from a server - after the page has loaded
Send data to a server - in the
background

9. What is web service?

**Web services** are XML-based information exchange systems that use the Internet for direct application-to-application interaction. These systems can include programs, objects, messages, or documents. A **web service** is a collection of open protocols and standards **used** for exchanging data between applications or systems

10. What are the advantages of web service?

(i) Interoperability-Web Services typically work outside of private networks, offering developers a non-proprietary route to their solutions

(ii) Usability - Web Services allow the business logic of many different systems to be exposed over the Web.

(iii) Reusability-reuse Web Service components as appropriate in other services (iv)Deployability -Web Services are deployed over standard Internet technologies

11. What are the standards required for web services.

(i) Extensible Markup Language (XML)

(ii) Hypertext Transfer

Protocol (HTTP) (iii)SOAP

(iv) Universal Description, Discovery, and Integration (UDDI)

(v) Web Services Description Language (WSDL).

12. Define serialization.

**Serialization** is a process of converting an object into a stream of data so that it can be easily transmittable over the network or can be continued in a persistent storage location.

**Serialization** is used by Remote process, **Web Services** SOAP uses serialization for transmitting data between a server and a client

13. List the basic concepts behind JAX-RPC technology.

JAX-RPC (Java API for XML-Based RPC) is an application program interface (API) in the Java Web Services Developer Pack (WSDP) that enables Java developers to include remote procedure calls (RPCs) with Web services or other Web-based applications

14. What is UDDI?

**(i)** UDDI stands for **Universal Description, Discovery, and Integration.**

(ii) UDDI is a specification for a distributed registry of web services.

(iii) UDDI is a platform-independent, open framework.

(iv) UDDI can communicate via SOAP, CORBA, Java RMI Protocol.

(v) UDDI uses Web Service Definition Language(WSDL) to describe interfaces to web services.

(vi) UDDI is seen with SOAP and WSDL as one of the three foundation standards of web services.

15. Explain the term XML Schema.

XML Schema is commonly known as **XML Schema Definition (XSD)**. It is used to describe and validate the structure and the content of XML data. XML schema defines the elements, attributes and data types. Schema element supports Namespaces.

16. What is the purpose of XML schema?

It is used to describe and validate the structure and the content of XML data. XML schema defines the elements, attributes and data types. Schema element supports Namespaces. It is similar to a database schema that describes the data in a database.

17. Define the need for SOAP.

**SOAP** is a communication protocol designed to communicate via Internet. SOAP can extend HTTP for XML messaging. SOAP provides data transport for Web services. SOAP can exchange complete documents or call a remote procedure. SOAP can be used for broadcasting a message

18. What are SOAP elements?

A SOAP message is an ordinary XML document containing the following elements: An Envelope element that identifies the XML document as a SOAP message. A Header element that contains header information. A Body element that contains call and response information

19. What is a web service registry and its function.

Web Services Discovery provides access to software systems over the Internet using standard protocols.A provider can explicitly register a service with a Web Services Registry such as UDDI or publish additional documents intended to facilitate discovery such as Web Services Inspection Language (WSIL) documents.

20. State the significance of a WSDL document. Give some uses of WSDL.

WSDL is often used in combination with **SOAP** and XML Schema to provide web services over the Internet. A client program connecting to a web service can read the WSDL to determine what functions are available on the server. Any special datatypes used are embedded in the WSDL file in the form of XML Schema.

# WEB TECHNOLOGY PART B & C

# UNIT-1

## 1. Give the structure of HTTP request message and explain it in detail.

**Overall Structure**

Every HTTP request message has the same basic structure:

- Start line
- Header field(s) (one or more)
- Blank line
- Message body (optional)

Every start line consists of three parts, with a single space used to separate adjacent parts:

**1.** Request method

**2.** Request-URI portion of web address

**3.** HTTP version

**HTTP Version**

The initial version of HTTP was referred to as HTTP/0.9, and the first Internet RFC

(Request for Comments; see the References section (Section 1.9) for more on RFCs) regarding HTTP described HTTP/1.0. In 1997, HTTP/1.1 was formally defined, and is currently an Internet Draft Standard [RFC-2616].

**Request-URI**

The second part of the start line is known as the *Request-URI*. The concatenation of the string http://, the value of the Host header field (www.example.org, in this example), and the

Request-URI (/ in this example) forms a string known as a *Uniform Resource Identifier* (URI). A URI is an identifier that is intended to be associated with a particular resource (such as a web page or graphics image) on the World Wide Web.

**Request Method**

The standard HTTP methods and a brief description of each are shown in below Table.

| Method | Requests server to . . . |
|---|---|
| GET | return the resource specified by the Request-URI as the body of a response message. |
| POST | pass the body of this request message on as data to be processed by the resource specified by the Request-URI. |
| HEAD | return the same HTTP header fields that would be returned if a GET method were used, but not return the message body that would be returned to a GET (this provides information about a resource without the communication overhead of transmitting the body of the response, which may be quite large). |
| OPTIONS | return (in Allow header field) a list of HTTP methods that may be used to access the resource specified by the Request-URI. |
| PUT | store the body of this message on the server and assign the specified Request-URI to the data stored so that future GET request messages containing this Request-URI will receive this data in their response messages. |
| DELETE | respond to future HTTP request messages that contain the specified Request-URI with a response indicating that there is no resource associated with this Request-URI. |
| TRACE | return a copy of the complete HTTP request message, including start line, header fields, and body, received by the server. Used primarily for test purposes. |

The method part of the start line of an HTTP request must be written entirely in uppercase letters, as shown in the table. In addition to the methods shown, the HTTP/1.1standard defines a CONNECT method, which can be used to create certain types of secure connections.The primary HTTP method is GET. This is the method used when you type a URL intothe Location bar of your browser. It is also the method that is used by default when you click ona link in a document displayed in your browser and when the browser downloads images for display within an HTML document. The POST method is typically used to send information collected from a form displayed within a browser, such as an order-entry form, back to the web server. The other methods are not frequently used by web developers, and we will therefore not discuss them further here.

# Header Fields and MIME Types

The Host header field is used when forming the URI associated with an HTTP request.
The Host header field is required in every HTTP/1.1 request message.

HTTP/1.1 also defines a number of other header fields, several of which are commonly used by modern browsers. Each header field begins with a *field name*, such as Host, followed by a colon and then a *field value*. White space is allowed to precede or follow the field value, but

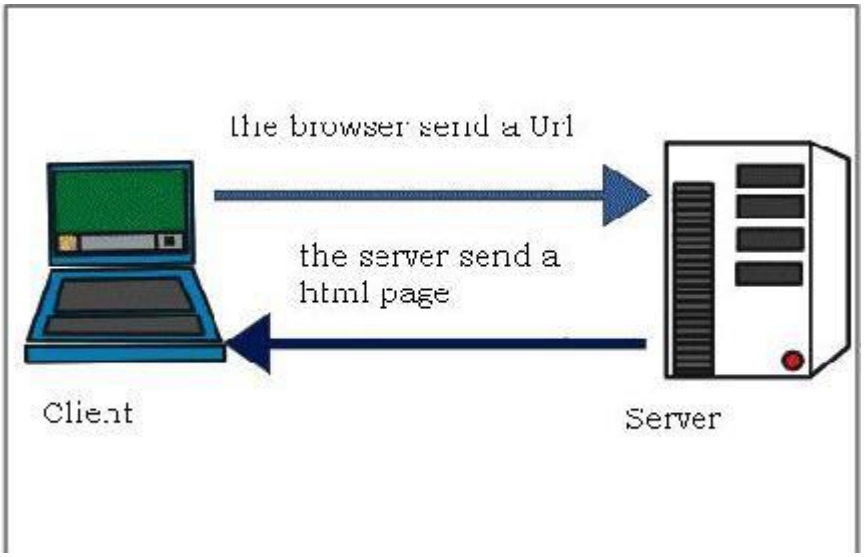
such white space is not considered part of the value itself.

```
POST /servlet/EchoHttpRequest HTTP/1.1
host: www.example.org:56789

user-agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.4)
accept: text/xml,application/xml,application/xhtml+xml,
text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,
image/gif;q=0.2,*/*;q=0.1
accept-language: en-us,en;q=0.5
accept-encoding: gzip,deflate

accept-charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
connection: keep-alive

keep-alive: 300
content-type: application/x-www-form-urlencoded
content-length: 13

doit=Click+me
```

**2. List and Explain the steps involved in a web based client server communication.**

- A web server is a program that uses the client/server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). There are two leading Web servers Apache which is the most widely-used Web server program, and Microsoft's Internet Information Server (IIS). Web servers often come as part of a larger package of Internet- and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, securitycharacteristics, and publishing, search engine, and site building tools that may come with it.
- On a more physical view, a web server is a computer connected on internet which stores many Hypertext Mark-up Language (HTML) pages, which can be composed of one or many web sites that many Computers connected on the internet should access with particular

rights




The principle of communication between a client and a server is composed of successions of requests and responses. The principle of communication is as explain below:

- A Web client (or browser) sends requests to a Web server. Every retrievable piece ofinformation on the Web is identified by a Uniform Resource Locator (URL), which includes the name of the object, where it is located, and the protocol used to get it.
- The Web server is responsible for document storage and retrieval. It sends the document requested (or an error message) back to the requesting client.
- The Browser interprets and presents the document. The browser is responsible fordocument presentation.

# HyperText Transfer Protocol (HTTP):

The language that Web clients and servers use to communicate with each other is called the Hypertext Transfer Protocol (HTTP). All Web clients and servers must be able to speak HTTP in order to send and receive hypermedia documents

HTTP is the set of rules for transferring files (text, graphic images, sound, video,and other multimedia files) on the World Wide Web. As soon as a Web user opens their Web browser, the user is indirectly making use of HTTP. HTTP is an application protocol that runs on

top of the TCP/IP suite of protocols (the foundation protocols for the Internet).

HTTP concepts include (as the Hypertext part of the name implies) the idea that files can contain references to other files whose selection will elicit additional transfer requests. Any Web server machine contains, in addition to the Web page files it can serve and an HTTP daemon, aprogram that is designed to wait for HTTP requests and handle them when they arrive. Your Web browser is an HTTP client, sending requests to server machines. When the browser user enters file requests by either "opening" a Web file or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address (IP address) indicated by the URL. The HTTP daemon in thedestination server machine receives the request and sends back the requested file or files associated with the request. (A Web page often consists of more than one file.

**3. State and explain any four HTML elements in detail.**

These elements include some of the most fundamental, such as elements for creating hyperlinks and displaying images. We will use a single example to illustrate the elements described in this section.

**Headings: h1 and Friends**

h1 and h2 are examples of HTML*heading* elements. HTML markup such as

Some Common HTML Elements

<h1> </h1>

<h2></h2>

Browsers will typically display each heading in a different type face, with h1 the largest and in bold while

<body>

<h1>

Some Common HTML Elements

</h1>

<h2>

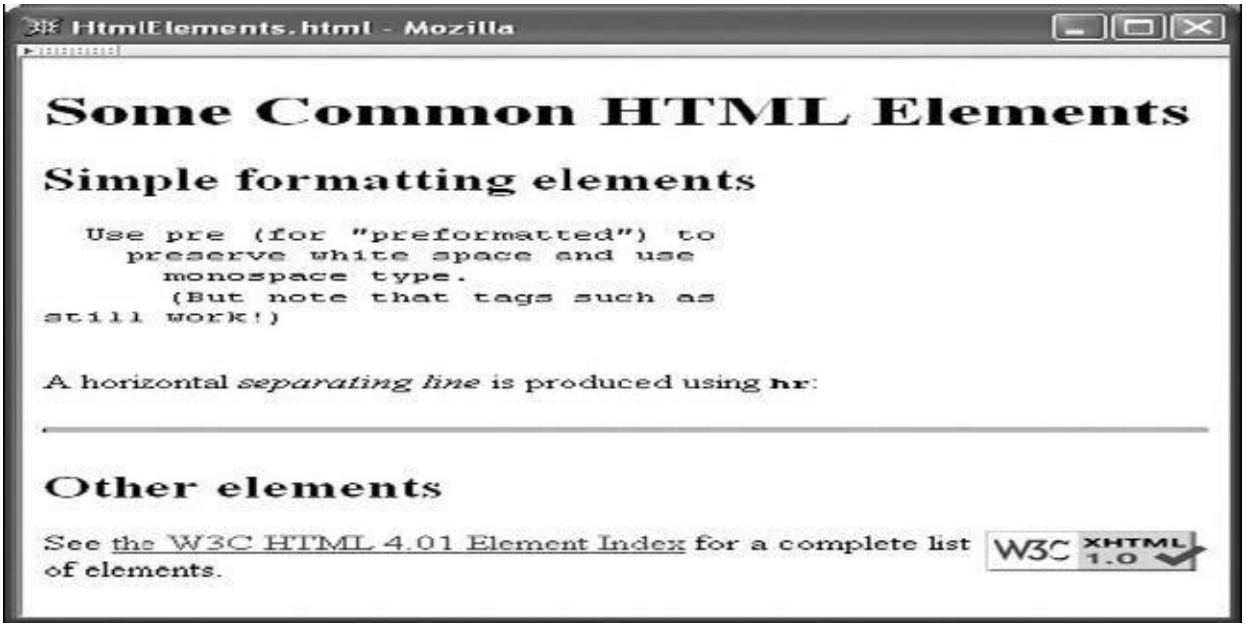
Simple formatting elements

</h2>

```
<pre>
Use pre (for "preformatted") to preserve white space and use monospace type. (But note
that tags such as<br />still work!)
</pre>
<p>
A horizontal <span style="font-style:italic">separating line</span> is produced using
<tt><strong>hr</strong></tt>:
</p>
<hr />
<h2>
Other elements
</h2>
<!-- Notice that img must nest within a "block" element,
such as p -->

<p>
<img
src="http://www.w3.org/Icons/valid-xhtml10"
alt="Valid XHTML 1.0!" height="31" width="88"
style="float:right" />

See
<a href="http://www.w3.org/TR/html4/index/elements.html">the
W3C HTML 4.01 Element Index</a>

for a complete list of elements.
</p>
</body>
```

**Spacing: pre and br**

The pre element is used to override a browser's normal white space processing. So, in the example, the HTML markup




However, a potential difficulty with using pre is that the content of a pre element is still considered to be HTML by the browser. This means, for example, that if a less than symbol (<) appears in the content, it will be viewed as the beginning of a tag. This is why the text still work!) appears on a line by itself: the browser encounters the string <br /> and interprets it as markup, not as text. In fact, the br element in HTML represents a line break. It causes the browser to start a new line, much as a \n character causes a new line of output to begin when written by a C++ or Java program.

The br element is an example of an *empty element*. An empty element is one that is not allowed to contain content. That is, it is syntactically illegal to write HTML markup such as

<br>
Content of the br element.
</br>

**Formatting Text Phrases: span, strong, tt, etc.**

HTML provides a number of different means for performing the sorts of text-oriented tasks that we identify with word processing, such as boldfacing or changing the font or even the color of a word or phrase. One way to specify the style of words and phrases is by making the text the content of a span element and setting the value of the style attribute appropriately. For example, will display separating line in italics, assuming an italic font is available on the display

device.

```
<span style="font-style:italic">separating line</span>
```

For example, text can be made boldface by making it the content of a strong element:

hr

Another element, em, marks its content as something that should be given “emphasis,” which in practice means that the content is displayed in italics in most browsers.

**Horizontal Rule: hr**

The hr element adds a horizontal line to the document. This line appears below the Preceding HTML content and above the content following the hr element

**Images: The img Element**

The “image” element img is the primary means of including a graphic in a document, and is illustrated in our example by

```
<img
src="http://www.w3.org/Icons/valid-xhtml10"
alt="Valid XHTML 1.0!" height="31" width="88"
style="float:right" />
```

The src attribute of this element specifies the URL of an image to be requested via the HTTP GET method.

The alt attribute on the img element specifies text that will be displayed by a browser that is unable to display images or that can be used to provide information about the image to visually impaired users. This text should therefore be descriptive of the image.

**Links: The a Element**

Finally, we come to the core “hypertext” part of HTML: the a, or *anchor*, element (the reason for this name will be discussed in a moment). This element is the primary means of creating a clickable link (a *hyperlink*) within a document. The anchor in our example appeared in the following context: See for a complete list of elements.

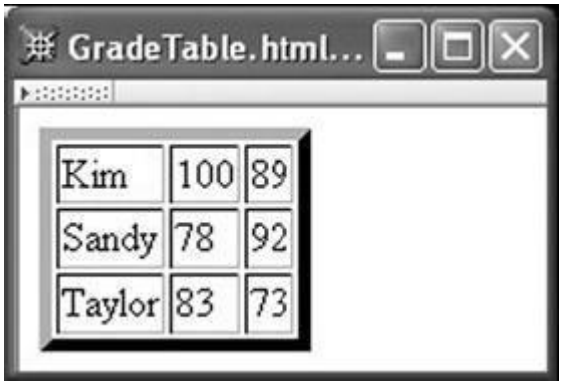
```
<a href="http://www.w3.org/TR/html4/index/elements.html">the
W3C HTML 4.01 Element Index</a>
```

**4. Explain the way in which data can be presented in a tabular form using HTML**

HTML provides a fairly sophisticated model for presenting data in tabular form. Columns and rows will automatically size to contain their data, although there are also various ways to specify column widths; individual table cells can span multiple rows and/or columns; header and/or footer rows can be supplied; and so on. There are also various options for changing the visual appearance of a table, such as the widths of its internal cell-separating lines (*rules*) and external borders. Most of the visual features will be discussed in the next chapter on style sheets.

In this, some of the basic features of structuring and formatting HTML tables will be presented. Simple tables are simple to represent in HTML. For example, a table of student grades could be written as follows and produces the table shown

```
<table border="5">
<tr>
<td>Kim</td><td>100</td><td>89</td>
</tr>
<tr>
<td>Sandy</td><td>78</td><td>92</td>
</tr>
<tr>
<td>Taylor</td><td>83</td><td>73</td>
</tr>
</table>
```



The table in this example is not very informative by itself. For example, there is no table caption, and there are no headers to define what the columns represent. This is easily corrected as shown in the next example<table border="5">

<caption>

COSC 400 Student Grades

</caption>

<tr>

<td> </td><td> </td><th colspan="2">Grades</th>

</tr>

<tr>

<td> </td><th>Student</th><th>Exam 1</th><th>Exam 2</th>

</tr>

<tr>

<th rowspan="2">Undergraduates</th><td>Kim</td><td>100</td><td>89</td>

</tr>

<tr>

<td>Sandy</td><td>78</td><td>92</td>

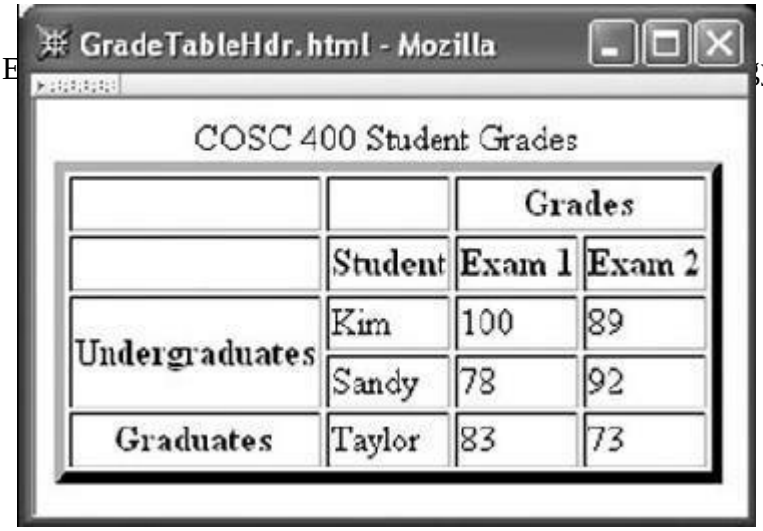
</tr>

<tr>

<th>Graduates</th><td>Taylor</td><td>83</td><td>73</td>

</tr>

</table>




**5 . Explain the capabilities of web client and web server.**

**Web Client:**

A *web client* is software that accesses a web server by sending an HTTP request message and processing the resulting HTTP response. Web browsers running on desktop or laptop computers are the most common form of web client software, but there are many other forms of client software, including text-only browsers, browsers running on cell phones, and browsers that speak a page (over the phone, for example) rather than displaying the page.

In general, any web client that is designed to directly support user access to web servers is known as a *user agent*.Furthermore, some web clients are not designed to be used directly by humans at all. For example, software *robots* are often used to automatically crawl the Web and download information for use by search engines (and, unfortunately, e-mail spammers).For a time, a "browser war" was waged between Netscape and Microsoft, with each company trying to add features and performance to its browser in order to increase its market share. Netscape soon found itself at a disadvantage, however, as Microsoft began bundling IE with its popular Windows R_ operating system. The war soon ended, and Microsoft was victorious. Netscape, acquired by America Online (at the time primarily an Internet service provider), chose to make its source code public and launched the Mozilla project as an opensource approach to developing new core functionality for the Netscape R_ browser. In particular, Netscape browser releases starting with version 6.0 have been based on software developed as part of the Mozilla project. At the time of this writing, IE is by far the most widely used browser in the world.

However, the MozillaTM and FirefoxTM browsers from the Mozilla Foundation are

increasinglypopular, and other browsers, including the OperaTM and SafariTM browsers, also havesignificant user communities.

**Server Features**

The primary feature of every web server is to accept HTTP requests from web clients and return an appropriate resource (if available) in the HTTP response. Even this basic functionality involves a number of steps (the quoted terms used in this list are defined in subsequent paragraphs):

**1.** The server calls on TCP software and waits for connection requests to one or more ports. When a connection request is received, the server dedicates a "subtask" to handling this connection.

**2.** The subtask establishes the TCP connection and receives an HTTP request.

**3.** The subtask examines the Host header field of the request to determine which "virtual host" should receive this request and invokes software for this host.

**4.** The virtual host software maps the Request-URI field of the HTTP request start line to a resource on the server.

**5.** If the resource is a file, the host software determines the MIME type of the file (usually by a mapping from the file-name extension portion of the Request-URI), and creates an HTTP response that contains the file in the body of the response message.

**6.** If the resource is a program, the host software runs the program, providing it with information from the request and returning the output from the program as the body of an HTTP response message.

**7.** The server normally logs information about the request and response—such as the IP address of the requester and the status code of the response—in a plain-text file.

**8.** If the TCP connection is kept alive, the server subtask continues to monitor the connection until a certain length of time has elapsed, the client sends another request, or the client initiates a connection close.

# 6.List and discuss any 4 HTTP request methods.

| Method | Requests server to . . . |
|---|---|
| GET | return the resource specified by the Request-URI as the body of a response message. |
| POST | pass the body of this request message on as data to be processed by the resource specified by the Request-URI. |
| HEAD | return the same HTTP header fields that would be returned if a GET method were used, but not return the message body that would be returned to a GET (this provides information about a resource without the communication overhead of transmitting the body of the response, which may be quite large). |
| OPTIONS | return (in Allow header field) a list of HTTP methods that may be used to access the resource specified by the Request-URI. |
| PUT | store the body of this message on the server and assign the specified Request-URI to the data stored so that future GET request messages containing this Request-URI will receive this data in their response messages. |
| DELETE | respond to future HTTP request messages that contain the specified Request-URI with a response indicating that there is no resource associated with this Request-URI. |
| TRACE | return a copy of the complete HTTP request message, including start line, header fields, and body, received by the server. Used primarily for test purposes. |

**7 Discuss the structure of the HTTP response message.**

An HTTP response message consists of a status line, header fields, and the body of the response, in the following format:

- Status line
- Header field(s) (one or more)
- Blank line
- Message body (optional)

# Response Status Line

The example status line shown earlier was

HTTP/1.1 200 OK

| Field Name | Use |
|---|---|
| Host | Specify *authority* portion of URL (host plus port number; see Section 1.6.2). Used to support *virtual hosting* (running separate web servers for multiple fully qualified domain names sharing a single IP address). |
| User-Agent | A string identifying the browser or other software that is sending the request. |
| Accept | MIME types of documents that are acceptable as the body of the response, possibly with indication of preference ranking. If the server can return a document according to one of several formats, it should use a format that has the highest possible preference rating in this header. |
| Accept-Language | Specifies preferred language(s) for the response body. A server may have several translations of a document, and among these should return the one that has the highest preference rating in this header field. For complete information on registered language tags, see [RFC-3066] and [ISO-639-2]. |
| Accept-Encoding | Specifies preferred encoding(s) for the response body. For example, if a server wishes to send a compressed document (to reduce transmission time), it may only use one of the types of compression specified in this header field. |
| Accept-Charset | Allows the client to express preferences to a server that can return a document using various character sets (see Section 1.5.4). |
| Connection | Indicates whether or not the client would like the TCP connection kept open after the response is sent. Typical values are `keep-alive` if connection should be kept open (the default behavior for servers/clients compatible with HTTP/1.1), and `close` if not. |
| Keep-Alive | Number of seconds TCP connection should be kept open. |
| Content-Type | The MIME type of the document contained in the message body, if one is present. If this field is present in a request message, it normally has the value shown in the example, application/x-www-form-urlencoded. |
| Content-Length | Number of bytes of data in the message body, if one is present. |
| Referer | The URI of the resource from which the browser obtained the Request-URI value for this HTTP request. For example, if the user clicks on a hyperlink in a web page, causing an HTTP request to be sent to a server, the URI of the web page containing the hyperlink will be sent in the Referer field of the request. This field is not present if the HTTP request was generated by the user entering a URI in the browser's Location bar. |

**Response Header Fields**

Some of the header fields used in HTTP request messages, including Connection,Content-Type, and Content-Length, are also valid in response messages. The Content-Type of a response can be any one of the MIME type values specified by the Accept header field of the corresponding request.

**Cache Control**

Several of the response header fields described in Table 1.8 are used in conjunction with cache control. In computer systems, a *cache* is a repository for copies of information that originates elsewhere. A copy of information is placed in a cache in order to improve system performance. For example, most personal computer systems use a small, high-speed memory cache to hold copies of some of the data contained inRAMmemory, which is slower than cache memory.

**Character Sets**

Finally, a word about how characters are represented in web documents. As you know, characters are represented by integer values within a computer. A *character set* defines the mapping between these integers, or *code points*, and characters. For example, US-ASCII [RFC-1345] is the character set used to represent the characters used in HTTP header field names, and is also used in key portions of many other Internet protocols.

**8.Explain in detail the functions of a web server.**

A web server is a computer that stores websites on the Internet and delivers web pages to viewers upon request. This service is referred to as web hosting. Every web server has a unique address, called an Internet Protocol address, that tells other computers connected to the Internet where to find the server on the vast network. The Internet Protocol (IP) address looks something like this: 69.93.141.146; this address links to a more human-friendly address, such as http://www.wisegeek.com. Web hosts rent out space on their web servers for people or businesses to set up their own websites, and the web server allocates a unique website address to each website it hosts.

The following table shows the Web Server functions with a description of the purpose of each.

| Programming element | Description |
|---|---|
| AddHeader | This callback function is provided by the Web Server. ISAPI filters call this function to add an HTTP header to the outgoing response. |
| AddResponseHeaders | This callback function is provided by the Web Server. ISAPI filterscall this function to add a header to the HTTP response. |
| | |
| | |

**9 Explain how tabbies can be inserted into a HTML document with an example.**

**HTML Tables**

Tables are defined with the <table> tag.

A table is divided into rows (with the <tr> tag), and each row is divided into data cells (with the <td> tag). td stands for "table data," and holds the content of a data cell. A <td> tag can contain text, links, images, lists, forms, other tables, etc.

## Table Example

```
<table border="1">
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>
```

How the HTML code above looks in a browser:

| | |
|---|---|
| row 1, cell 1 | row 1, cell 2 |
| row 2, cell 1 | row 2, cell 2 |

## HTML Tables and the Border Attribute

If you do not specify a border attribute, the table will be displayed without borders. Sometimes this can be useful, but most of the time, we want the borders to show.

To display a table with borders, specify the border attribute

```
<table border="1">
<tr>
<td>Row 1, cell 1</td>
<td>Row 1, cell 2</td>
</tr>
</table>
```

## HTML Table Headers

Header information in a table are defined with the <th> tag.

All major browsers display the text in the <th> element as bold and centered.

```
<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
```

```
<tr>

<td>row 2, cell 1</td>

<td>row 2, cell 2</td>

</tr>

</table>
```

How the HTML code above looks in your browser:

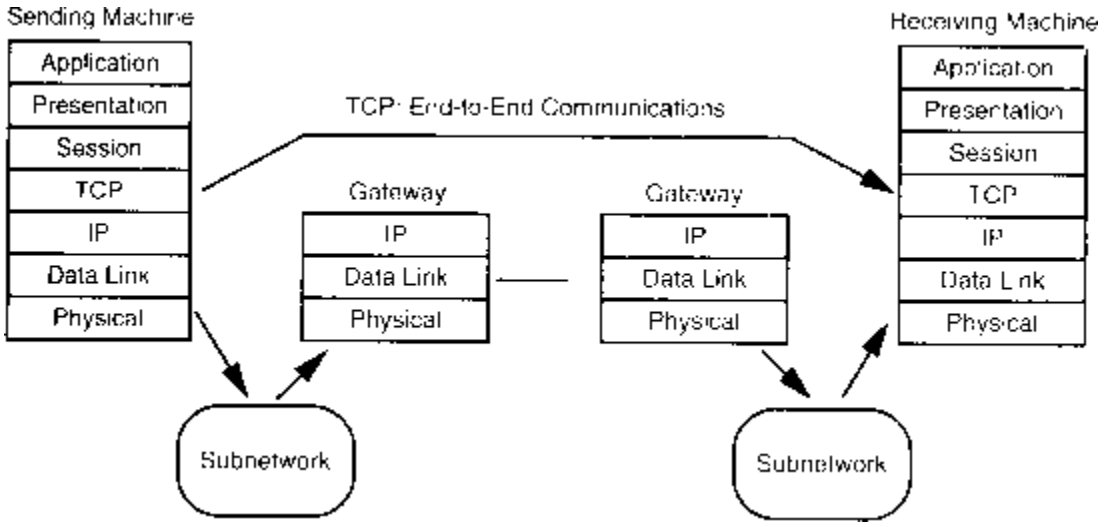
| **Header 1** | **Header 2** |
|---|---|

| | |
|---|---|
| row 1, cell 1 | row 1, cell 2 |
| row 2, cell 1 | row 2, cell 2 |

## 10 Explain TCP/IP in detail.

TCP manages the flow of datagrams from the higher layers, as well as incoming datagrams from the IP layer. It has to ensure that priorities and security are respected. TCP must be capable of handling the termination of an application above it that was expecting incoming datagrams, as well as failures in the lower layers. TCP also must maintain a state table of all data streams in and out of the TCP layer. The isolation of these services in a separate layer enables applications to be designed without regard to flow control or message reliability. Without the TCP layer, each application would have to implement the services themselves, which is a waste of resources.

TCP resides in the transport layer, positioned above IP but below the upper layers and their applications, as shown in Figure 1. TCP resides only on devices that actually process datagrams, ensuring that the datagram has gone from the source to target machines. It does not reside on a device that simply routes datagrams, so there is no TCP layer in a gateway. This makes sense, because on a gateway the datagram has no need to go higher in the layered model than the IP layer.



Because TCP is a connection-oriented protocol responsible for ensuring the transfer of a datagram from the source to destination machine (end-to-end communications), TCP must receive communications messages from the destination machine to acknowledge receipt of the datagram. The term *virtual circuit* is usually used to refer to the handshaking that goes on between the two end machines, most of which are simple acknowledgment messages (either confirmation of receipt or a failure code) and datagram sequence numbers

**12.List any two differences between HTML respect to elements. and XHTML with**

**Also explain about the XHTML DTD.**

**HTML** stands for HyperText Markup Language. It is a well known mark up language used to develop web pages. It has been around for a long time and is commonly used in webpage design. XML or Extensible Markup Language defines a set of rules for encoding documents in a format that can be read by both, human and computer.

**XHTML,** on the other hand, stands for Extensible HyperText Markup Language. It is a markup language written in XML. It is a collection of XML markup languages that mirror or extend versions of HTML. Essentially, it is a hybrid between HTML and XML specifically designed for Net device displays. It is HTML defined as an XML application.

**DTD's**XHTML documents have three parts: the DOCTYPE (which contains the DTD declaration), the head and the body. To create web pages that properly conform to the XHTML 1.0 standard, each page must include a DTD declaration; either strict, transitional, or frameset. Each of the three DTD's is described (with an example) below:

**Strict**

You should use the strict DTD when your XHTML pages will be marked up cleanly, free of presentational clutter. You use the strict DTD together with cascading style sheets, because it doesn't allow attributes like "bgcolor" to be set for the <body> tag, etc.

The strict DTD looks like this:

<!DOCTYPE html

PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"

"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">

**Transitional**

The transitional DTD should be used when you need to take advantage of the presentational features that are available through HTML. You should also use the transitional DTD when you want to support older browsers that don't have built-in support for cascading style sheets.

The transitional DTD looks like this:

<!DOCTYPE html

PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"

"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

**Frameset**

You should use the frameset DTD when your XHTML page will contain frames. The frameset DTD looks like this:

<!DOCTYPE html

PUBLIC "-//W3C//DTD XHTML 1.0 Frameset//EN"

"http://www.w3.org/TR/xhtml1/DTD/xhtml1-frameset.dtd">

**13.Explain in detail the working of the following Internet Protocols.**

**(i) TCP/IP**

The Transmission Control Protocol (**TCP**) is one of the core protocols of the Internet protocol suite (IP), and is so common that the entire suite is often called TCP/IP. TCP provides reliable, ordered, error-checked delivery of a stream of octets between programs running on computers connected to a local area network, intranet or the public Internet. It resides at the transport layer.

Web browsers use TCP when they connect to servers on the World Wide Web, and it is usedto deliver email and transfer files from one location to another.Applications that do not require the reliability of a TCP connection may instead use theconnectionless User Datagram Protocol (UDP), which emphasizes low-overhead operationand reduced latency rather than error checking and delivery validation.

**(ii) HTTP**

The **Hypertext Transfer Protocol** (**HTTP**) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.Hypertext is structured text that uses logical links (hyperlinks) between nodes containingtext. HTTP is the protocol to exchange or transfer hypertext. The standards development of HTTP was coordinated by the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C), culminating in the publication of a series of Requests for Comments (RFCs), most notably RFC 2616 ,which defines HTTP/1.1, the version of HTTP in common use.

## 12 Explain the purpose and way of creating lists in HTML documents.

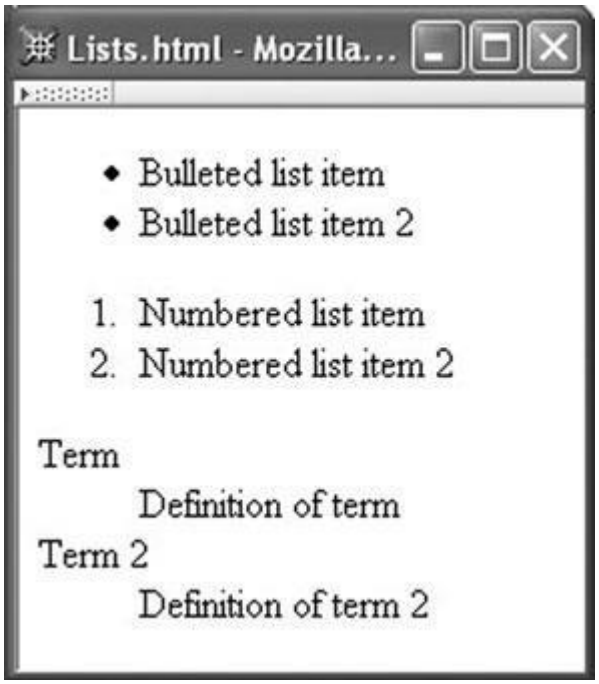
_ *Unordered:* A bullet list

_ *Ordered:* A numbered list

_ *Definition:* A list of terms and definitions for each

This figure was produced by the following HTML:

```
<ul>
<li>Bulleted list item</li>
<li>Bulleted list item 2</li>
</ul>
```




**Browser rendering the three HTML list types**

```
<ol>
<li>Numbered list item</li>
<li>Numbered list item 2</li>
</ol>
<dl>
<dt>Term</dt>
<dd>Definition of term</dd>
<dt>Term 2</dt>
<dd>Definition of term 2</dd>
</dl>
```

As shown, the HTML syntax for all three types of lists is similar. First, the type of list is indicated by using either a ul (unordered list), ol (ordered list), or dl (definition list) start tag (each of the tag names ends in the letter “el,” not the number “one”). All three elements are block elements, so a list by default begins on a new line when displayed in the browser. Each item in an unordered or ordered list is made the content of an li (list item) element. For a definition list, each term is made the content of a dt (definition term) element, and each term description is made the content of a dd element that immediately follows the dt element being described. For all three types of list, the list is terminated by following the last item in the list with the appropriate end tag. Lists can be nested to produce an outline layout. For example, the markup

```
<ul>
<li>Bulleted list item
<ul>
<li>Nested list item</li>
<li>Nested list item 2</li>
</ul>
</li>
<li>Bulleted list item 2</li>
```

```
</ul>
```


**Browser rendering nested unordered lists**

## UNIT II

**1.(i) Discuss about JavaScript debugging. (7)**

**(ii) Explain in detail CSS border and CSS outline. (6)**

**2.(i) Explain any eight CSS text properties. (7)**

**(ii) Discuss JavaScript Array object in detail. (6)**

**3.(i) List and explain in detail various selector strings. (7)**

**(ii) Explain the features of cascading style sheets. (6)**

**4.(i) Write a CSS which adds background images and indentation. (7)**

**(ii) Explain external style sheet with an example. (6)**

**5.(i) Explain in detail the CSS Box model in detail. (7)**

**(ii) List and explain the various positioning schemes in detail. (6)**

**6. List and describe the CSS Border Style Properties in detail with illustration. (13)**

**7. Apply CSS to a web page with the following requirements**

**(i) Paint the background gray (2)**

**(ii) Paint the sidebar yellow (2)**

**(iii) Set the artist h1 to be only uppercase (2)**

**(iv) Set the title h2 to be uppercase-first letter (2)**

**(v) Set a line spacing between the lines (2)**

**(vi) Set letter spacing between the letters in each span of type instruction (3)**

**8.(i) State and explain the types of statements in JavaScript. (6)**

**(ii) Explain how functions can be written in JavaScript with an example. (7)**

**9. Summarize about debugging in JavaScript. (13)**

**10. What are the various JavaScript objects? Explain each with an example. (13)**

**11. Show in detail about JavaScript variables and operators. (13)**

**12. Write the registration form for the creation of email account with all possible validations using JavaScript. (13)**

**13.(i) Explain the JavaScript array handling and array methods. (7)**

**(ii) Explain the following JavaScript objects. (6)**

**a. RegExp**

**b. Math**

**14.(i) Write JavaScript to find sum of first 'n' even numbers and display the result. Get the value of 'n' from user. (7) (ii) Write JavaScript to find factorial of a given number. (6)**

## UNIT III

**1.Explain in detail DOM event handling. Also explain with an example of creating a context menu. [Note: A context menu is one that that is shown when the user right-clicks anywhere in the document]. (13)**

**2.(i) Explain about the document tree in detail. (7)**

**(ii) Explain DOM event handling in detail. (6)**

**3.(i) List and explain the various types of document nodes. (7)**

**(ii) Explain in detail about event object and event listeners with an example. (6)**

**4.With a suitable example discuss about event propagation. (13)**

**5.List the properties of mouse events associated with DOM2 with an example. (13)**

**6.What are the various levels of DOM? Explain each of them in detail. (13)**

**7.Make use of some of the style object in DOM to modify the elements' style. (13)**

**8.(i) Explain about architecture of servlet. (7)**

**(ii) Explain the purpose of the following DOM method and properties, (6)**

**a. get Element By Id**

**b. create Element**

**c. create Text Node**

**d. append child**

**e. parent Node**

**9.Write a servlet to illustrate the principle of Cookies and explain. (13)**

**10. Explain the Servlet operation in detail with a sample Servlet program. (13)**

**11. What is a session? Explain how client state is maintained using session and also explain about session tracking and session management using an example. (13)**

**12. Explain the servlet life cycle with an example. (13)**

**13. Write a Java code for getting the details of the items to be purchased from a client and to update the inventory of the shop after selling. Also bill should be prepared for the client. Maintain the transaction table also just by inserting these purchase item details at the shop use JDBC for transactions. (13)**

**14.(i) Write a code for creating cookies with name of person and secret code at the server, after getting these details from client using HTML form. How these details at the server side using HTTP servlet are displayed? (7)**

**(ii) Write a code to display the current and yesterday's gold rate using session object. (6)**

## UNIT IV

**1.State and explain the information in a JSP document in detail. (13)**

**2.(i) Write a client server JSP program to find simple interest and display the result in the client.**

**(ii) Write about the JSP tag libraries. (6)**

**3. Identify the objects associated with JSP and highlight the features of each object. Explain the various JSP elements. (13)**

**4.Explain in detail the creation, instantiation and usage of java beans objects. (13)**

**5.What is a JavaBeans component? How will you use the JSP language elements for accessing Beans in your JSP pages? (13)**

**6.Discover a JSP code to access a table and records from a student database to obtain the result of a student. (13)**

**7.Classify the implicit objects involved in JavaScript Expression Language. (13)**

**8.(i) Explain the role of XML name spaces with examples. (7)**

**(ii) Explain the features of XML path language. (6)**

**9.Discover a XML document to store voter ID, voter name, address and date of birth details and validate the document with the help of DTD. (13)**

**10. Write XSLT code to display employee details in a Table form which is stored is XML. (13)**

**11.(i) Explain XPATH nodes in detail. (7)**

**(ii) Explain about the object that helps AJAX reload parts of a web page without reloading the whole page. (6)**

**12.(i) List and explain the XML syntax rules in detail. (7)**

**(ii) Explain how a XML document can be displayed on a browser.(6)**

**13.Explain in detail the XML schema, built in and user defined data type detail. (13)**

**Remembering**

**14.(i) Explain in detail about XSL. (7)**

**(ii) Explain about DOM based XML processing. (6)**

**UNIT-V**

**1.(i) Discuss the various aspects of JAX-RPC. (7)**

**(ii) Develop a Java Web Service that would do arithmetic operations. (6)**

**2.(i) What do you mean by AJAX? Write the advantages of AJAX. (7)**

**(ii) Write short notes on Event-oriented Parsing. (6)**

**3.(i) Discuss AJAX architecture and compare it with DOM and SAX. (7)**

**(ii) What languages are used to represent data in web? Explain any two of them. (6)**

**4. Discover about the development of a web application to illustrate the basics of AJAX. (13)**

**5. Explain about the XMLHttpRequest Object in detail. (13)**

**6. Brief the Return Document Forms in AJAX. (13)**

**7. Explain why the callback function is written as an anonymous function in the request phase function. (13)**

**8.(i) Explain in detail the steps involved in writing a web service.(7)**

**(ii) Explain the basic concepts of RPC. (6)**

**9. Describe the significance and working of WSDL with an example. (13)**

**10. Describe the major elements of SOAP. (13)**

**11. Explain the role of XML schema in building web services in detail. (13)**

**12. Design a railway reservation system using UDDI and WSDL for the following case study.**

**Railway could register their services into an UDDI directory for checking the train rate and reservation. Travel agencies could then search the UDDI directory to find the railway reservation interface for ticket booking. (13)**

**13. Model a web service for calculator application. (13)**

**14.(i) Explain the JDBC database access in detail. (7)**

**(ii) Explain the SOAP elements in detail. (6)**

**CS8494-SOFTWARE ENGINEERING**

## TWO MARKS QUESTIONS & ANSWERS

## UNIT I

### 1. Write the IEEE definition of software engineering. (DEC-17)

Software engineering is a discipline in which theories, methods and tools are applied to develop

professional software.

### 2. What is Software? List its Characteristics. (May-18)

Software is nothing but a collection of computer programs that are related documents that are

Indented to provide desired features, functionalities and better performance.

**Characteristics:**

- Software is engineered, not manufactured.
- Software does not wear out.
- Most software is custom built rather than being assembled from components.

### 3. If you have to develop a word processing software product, what process model will you choose? Justify your answer. (May-18)

The incremental model can be used for developing a word processing software product. This is because the basic functionality of word editing can be developed and verified from the customer in the initial increment. Then in subsequent increments the advanced editing features can be added.

4. **Compare prototyping approaches in a software process. (May-18)**

There are two types of prototyping approaches in a software process

**Evolutionary prototyping:** In this approach of system development, the initial prototype is prepared and it is then refined through number of stages to final stage.

**Throw-away Prototyping:** Using this approach a rough practical implementation of the system is produced. The requirement problem can be identified from this implementation. It is then discarded. System is then developed using some different engineering paradigm.

5. **List two deficiencies in waterfall model. Which process model do you suggest to overcome each deficiency? (May-17)**

It is difficult to define all the requirement at the beginning of project, this model is not suitable for accommodating any changes.

**To overcome this deficiency:** Prototyping model.

It does not scale up to large project

**To overcome this deficiency:** Spiral model.

6. **What are the advantages of evolutionary prototyping?**

- Fast delivery of the working system.

- User is involved while developing the system.
- More useful system can be delivered.
- Specification, design and implementation work in co-ordinate manner.

## 7. What are the various categories of software?

- System software
- Application software
- Engineering/Scientific software
- Embedded software
- Web Applications
- Artificial Intelligence software

## 8. What are the challenges in software?

- Copying with legacy systems.
- Heterogeneity challenge
- Delivery times challenge

## 9. Define software process.

Software process is defined as the structured set of activities that are required to develop the software system.

## 10. What are the fundamental activities of a software process?

- Specification
- Design and implementation
- Validation
- Evolution

## 11. What are the umbrella activities of a software process?

- Software project tracking and control.
- Risk management.
- Software Quality Assurance.
- Formal Technical Reviews.
- Software Configuration Management.
- Work product preparation and production.
- Reusability management.
- Measurement.

## 12. What are the merits of incremental model?

- The incremental model can be adopted when there are less number of people involved in the project.
- Technical risks can be managed with each increment.
- For a very small time span at least core product can be delivered to the customer.

## 13. List the task regions in the Spiral model.

- **Customer communication –** In this region it is suggested to establish customer communication.
- **Planning –** All planning activities are carried out in order to define resources timeline and other project related activities.
- **Risk analysis –** The tasks required to calculate technical and management risks.
- **Engineering –** In this the task region,tasks required to build one or more representations of applications are carried out.
- **Construct and release –** All the necessary tasks required to construct, test, install the applications are conducted.
- **Customer evaluation –** Customer's feedback is obtained and based on the customer evaluation required tasks are performed and implemented at installation stage.

## 14. What are the drawbacks of spiral model?

- It is based on customer communication. If the communication is not proper then the software product that gets developed will not be the up to the mark.
- It demands considerable risk assessment. If the risk assessment is done properly then only the successful product can be obtained.

## 15. What is System Engineering?

System Engineering means designing, implementing, deploying and operating systems which include hardware, software and people.

## 16. List the process maturity levels in SEIs CMM.

**Level 1:Initial –** Few processes are defined and individual efforts are taken.

**Level 2:Repeatable –** To track cost schedule and functionality basic project management

processes are established.

**Level 3:Defined –** The process is standardized, documented and followed.

**Level 4:Managed –** Both the software process and product are quantitatively understood

and controlled using detailed measures.

**Level 5:Optimizing –** Establish mechanisms to plan and implement change.

## 17. What is the use of CMM?

Capability Maturity Model is used in assessing how well an organization's processes allow to complete and manage new software projects.

## 18. Name the Evolutionary process Models.

- Incremental model
- Spiral model
- WIN-WIN spiral model
- Concurrent Development

**19. Define software prototyping.**

Software prototyping is defined as a rapid software development for validating the requirements.

**20. What are the benefits of prototyping?**

- Prototype serves as a basis for deriving system specification.
- Design quality can be improved.
- System can be maintained easily.
- Development efforts may get reduced.
- System usability can be improved.

## 21. What are the advantages of evolutionary prototyping?

- Fast delivery of the working system.
- User is involved while developing the system.
- More useful system can be delivered.
- Specification, design and implementation work in co-ordinated manner.

## 22. What are the various Rapid prototyping techniques?

- Dynamic high level language development.
- Database programming.
- Component and application assembly.

**23. What are the new practices that are appended to XP to create IXP**

- Readiness Assessment
- Project Community
- Project Chartering
- Test Driven Management
- Retrospectives
- Continuous Learning

## 24. What is spike solution in XP?

The spike solution is very simple program to explore potential solution. The spike solution is build to only address the problem under examination and all other things can be overlooked.

## 25. What are the five values defined by beck that serve as a basis for the work performed in XP?

- Communication
- Simplicity
- Feedback

- Courage
- Respect

## UNIT II

### 1. What are the characteristics of SRS?

i. **Correct –** The SRS should be made up to date when appropriate requirements are identified.

ii. **Unambiguous –** When the requirements are correctly understood then only it is possible to

write an unambiguous software.

iii. **Complete –** To make SRS complete, it should be specified what a software designer wants to

create software.

iv. **Consistent –** It should be consistent with reference to the functionalities identified.

v. **Specific –** The requirements should be mentioned specifically.

**vi. Traceable –** What is the need for mentioned requirement? This should be correctly identified.

2. **Define Quality Function Development. Dec-17**

Quality Function deployment is a quality management technique which translates the customer needs and wants into technical requirements.

3. **What are the various types of traceability in software Engineering? May-17**

Various types of traceability in software Engineering are

- Source Traceability
- Requirement Traceability
- Design Traceability

4. **Differentiate between normal and exciting requirements.**

**Normal Requirements:** The requirements as per goals and objectives of the system are called normal requirements. For eg. Handling mouse and keyboard events for any GUI based system.

**Exciting Requirements:** When certain requirements are satisfied by the software beyond customer's expectation then such requirements are called exciting requirement. For eg. In word processing software system, if there are some exceptional page layout facilities then it falls in exciting requirements category.

5. **What is the purpose of petrinets?**

Petrinets are rigorously used to define the system. There are 3 types of components in petrinets. There are

Places

Transition

Arc.

6. What are the linkage between data flow and ER diagram?

Both the data flow diagram and ER diagram are system modeling techniques used during structured system analysis.

The ER diagram is used to represent the data model while data flow diagrams are used to represent the functional model.

7. **What are the objectives of Analysis modeling?**

i. To describe what the customer requires.
ii. To establish a basis for the creation of software design.
iii. To devise a set of valid requirements after which the software can be built.

8. **What is data modeling?**

Data modeling is the basic step in the analysis modeling. In data modeling the data

objects are examined independently of processing. The data model represents how data are related with one another.

**9.** hat is a data object?

Data object is a collection of attributes that act as an aspect, characteristic, quality, or descriptor of the object.

**10.** What are attributes?

Attributes are the one, which defines the properties of data object.

**11.** What is ERD?

Entity Relationship Diagram is the graphical representation of the object relationship pair. It is mainly used in database applications.

**12.** What is DFD?

Data Flow Diagram depicts the information flow and the transforms that are applied on the data as it moves from input to output.

**13.** What does Level0 DFD represent?

Level0 DFD is called as „fundamental system model" or „context model". In the context model the entire software system is represented by a single bubble with input and output indicated by incoming and outgoing arrows.

**14.** What is a state transition diagram?

State transition diagram is basically a collection of states and events. The events cause the system to change its state. It also represents what actions are to be taken on the occurrence of particular event.

**15.** Define Data Dictionary.

The data dictionary can be defined as an organized collection of all the data elements of

the system with precise and rigorous definitions so that user and system analyst will have a common understanding of inputs, outputs, components of stores and intermediate calculations.

**16.** What is the major distinction between user requirements and system requirement?

The user requirements describe both the functional and non functional requirements in such a way that they are understandable by the user who do not have detailed technical knowledge. On the other hand the system requirements are more detailed specification of system functions, services and constraints than user requirements. The user requirements are specified using natural language whereas system model expressed in system models.

**17.** Give Two Examples of non functional requirements.

Consider the library management system or which the two non functional requirements can be-

- The user who wishes to read the article on-line must be authenticated first
- The article must be displayed within in 5 seconds.

**18.** What do requirement process involve?

The requirement process involves

- Elicitation
- Analysis
- Validation

**19.** List the good characteristics of good SRS.

- SRS must be correct
- SRS must be unambiguous
- SRS must be complete
- SRS must be consistent
- SRS must be traceable

**20.** What are the elements of Analysis model?

i. Data Dictionary
ii. Entity Relationship Diagram
iii. Data Flow Diagram
iv. State Transition Diagram
v. Control Specification
vi. Process specification

## UNIT III

1. **What are the elements of design model?**
   i. Data design
   ii. Architectural design
   iii. Interface design
   iv. Component-level design

2. List out Design methods.

   The Design methods are
   - Object Oriented Design
   - Function Oriented Design

3. Define design process.

   Design process is a sequence of steps carried through which the requirements are translated into a system or software model.

4. List the principles of a software design.
   i. The design process should not suffer from “tunnel vision”.
   ii. The design should be traceable to the analysis model.
   iii. The design should exhibit uniformity and integration.
   iv. Design is not coding.
   v. The design should not reinvent the wheel.

**5.** Define Modularity.

The modularity is an approach used during the designing of the software system. I this approach, the software is divided into separately named and addressable components called modules. Due to modularity, the program becomes manageable.

**6.** What is the benefit of modular design?

Changes made during testing and maintenance becomes manageable and they do not

affect other modules.

**7.** What is a cohesive module?

A cohesive module performs only "one task" in software procedure with little interaction

with other modules. In other words cohesive module performs only one thing.

**8.** What are the different types of Cohesion?

**i.** Coincidentally cohesive –The modules in which the set I\of tasks are related with

each other loosely then such modules are called coincidentally cohesive.

**ii.** Logically cohesive – A module that performs the tasks that are logically related with

each other is called logically cohesive.

**iii.**Temporal cohesion – The module in which the tasks need to be executed in some

specific time span is called temporal cohesive.

**iv.**Procedural cohesion – When processing elements of a module are related with one

another and must be executed in some specific order then such module is called procedural

cohesive.

**v.** Communicational cohesion – When the processing elements of a module share the

data then such module is called communicational cohesive.

**9.** What is Coupling?

Coupling is the measure of interconnection among modules in a program structure. It depends

on the interface complexity between modules.

**10.** Write a note on FURPS model of design quality. (Dec-17)

FURPS stands for Functionality, Usability, Reliability, performance and supportability. These are the quality attributes used to measure design quality.

**11.** What is the need for architectural mapping using data flow? (May-16)

Transform mapping and transaction mapping is used for architectural mapping using data flow diagrams.

**12.** How can refactoring be made more effective? (May-16)

After careful analysis of design separate out the components that can be refactored. The refactor them and finally integrate and test them.

**13.** What UI design patterns are used for the following? (May-17, 18)

**a) Page layout b) Tables c) Navigation through menus and web pages**
**d) Shopping cart**

Page layout- card stack

Tables- Sorted Tables

Navigation through menus and web pages- Edit in place

Shopping cart- Shopping card which provide list of items selected for purchase.

**14.** What are the various types of coupling?

**i.** Data coupling – The data coupling is possible by parameter passing or data interaction.

**ii.** Control coupling – The modules share related control data in control coupling.

**iii.** Common coupling – The common data or a global data is shared among modules.

iv. Content coupling – Content coupling occurs when one module makes use of data or

control information maintained in another module.

**15.** What are the common activities in design process?

**i.** System structuring – The system is subdivided into principle subsystems components

and communications between these subsystems are identified.

**ii.** Control modeling – A model of control relationships between different parts of the

system is established.

iii. Modular decomposition – The identified subsystems are decomposed into modules.

**16.** What are the benefits of horizontal partitioning?

**i.** Software that is easy to test.

**ii.** Software that is easier to maintain.

**iii.** Propagation of fewer side effects.

**iv.** Software that is easier to extend.

**17.** What is vertical partitioning?

Vertical partitioning often called factoring suggests that the control and work should be distributed top-down in program structure.

**18.** What are the advantages of vertical partitioning?

**i.** These are easy to maintain changes.

**ii.** They reduce the change impact and error propagation.

**19.** What are the various elements of data design?

i. Data object – The data objects are identified and relationship among various data objects

can be represented using ERD or data dictionaries.

**ii.** Databases – Using software design model, the data models are translated into data structures and data bases at the application level.

**iii.**Data warehouses – At the business level useful information is identified from various databases and the data warehouses are created.

**20.** List the guidelines for data design.

**i.** Apply systematic analysis on data.

**ii.** Identify data structures and related operations.

**iii.** Establish data dictionary.

**iv.** Use information hiding in the design of data structure.

**v.** Apply a library of useful data structures and operations.

**21.** Name the commonly used architectural styles.

**i.** Data centered architecture.

**ii.** Data flow architecture.

**iii.** Call and return architecture.

**iv.** Object-oriented architecture.

**v.** Layered architecture.

**22.** What is Transform mapping?

The transform mapping is a set of design steps applied on the DFD in order to map the transformed flow characteristics into specific architectural style.

**23.** What is a Real time system?

Real time system is a software system in which the correct functionalities of the system are dependent upon results produced by the system and the time at which these results are produced.

## UNIT IV

**1.** Define software testing?

Software testing is a critical element of software quality assurance and represents the ultimate

review of specification, design, and coding.

**2.** What are the objectives of testing?

i. Testing is a process of executing a program with the intend of finding an error.
ii. A good test case is one that has high probability of finding an undiscovered error.
iii. A successful test is one that uncovers as an-yet undiscovered error.

**3.** What are the testing principles the software engineer must apply while performing the

software testing? (May-18)

i. All tests should be traceable to customer requirements.
ii. Tests should be planned long before testing begins.
iii. The pareto principle can be applied to software testing-80% of all errors uncovered during

testing will likely be traceable to 20% of all program modules.

iv. Testing should begin "in the small" and progress toward testing "in the large".
v. Exhaustive testing is not possible.
vi. To be most effective, an independent third party should conduct testing.

**4.** What are the two levels of testing?

**i.** Component testing Individual components are tested. Tests are derived from

developer‟s experience.

**ii.** System Testing The group of components are integrated to create a system or sub- system is done. These tests are based on the system specification.

**5.** What are the various testing activities?

**i.** Test planning

**ii.** Test case design

**iii.** Test execution

**iv.** Data collection

**v.** Effective evaluation

**6.** Write short note on black box testing.

The black box testing is also called as behavioral testing. This method fully focuses on the functional requirements of the software. Tests are derived that fully exercise all functional requirements.

**7.** What is equivalence partitioning?

Equivalence partitioning is a black box technique that divides the input domain into classes of data. From this data test cases can be derived. Equivalence class represents a set of valid or invalid states for input conditions.

**8.** What is a boundary value analysis?

A boundary value analysis is a testing technique in which the elements at the edge of the domain are selected and tested. It is a test case design technique that complements equivalence partitioning technique. Here instead of focusing on input conditions only, the test cases are derived from the output domain.

**9.** What are the reasons behind to perform white box testing?

There are three main reasons behind performing the white box testing.

**1.** Programmers may have some incorrect assumptions while designing or implementing

some functions. Due to this there are chances of having logical errors in the program. To

detect and correct such logical errors procedural details need to be examined.

**2.** Certain assumptions on flow of control and data may lead programmer to make design

errors. To uncover the errors on logical path, white box testing is must.

**3.** There may be certain typographical errors that remain undetected even after syntax and type

checking mechanisms. Such errors can be uncovered during white box testing.

**10.** What is cyclomatic complexity? (May-14)

Cyclomatic complexity is a software metric that gives the quantitative measure of logical complexity of the program. The Cyclomatic complexity defines the number of independent paths in the basis set of the program that provides the upper bound for the number of tests that must be conducted to ensure that all the statements have been executed at least once.

**11.** How to compute the cyclomatic complexity?

The cyclomatic complexity can be computed by any one of the following ways.

1. The numbers of regions of the flow graph correspond to the cyclomatic complexity.
2. Cyclomatic complexity,V(G),for the flow graph,G,is defined as: V(G)=E-N+2,

E -- number of flow graph edges, N -- number of flow graph nodes

3. V(G)=P+1 Where P is the number of predicate nodes contained in the flow graph.

**12.** Distinguish between verification and validation.

Verification refers to the set of activities that ensure that software correctly implements a specific function.

Validation refers to a different set of activities that ensure that the software that has been built is traceable to the customer requirements.

According to Boehm,

- Verification:" Are we building the product right?"

- Validation:" Are we building the right product?"

**13.** What are the various testing strategies for conventional software? (May-06)

i. Unit testing ii. Integration testing.

iii. Validation testing. iv. System testing.

**14.** Write about drivers and stubs. (Dec -17)

Drivers and stub software need to be developed to test incompatible software.

- The " driver" is a program that accepts the test data and prints the relevant results.
- The " stub" is a subprogram that uses the module interfaces and performs the minimal data manipulation if required.

**15.** What are the approaches of integration testing?

The integration testing can be carried out using two approaches.

1. The non-incremental testing.
2. Incremental testing.

**16.** What are the advantages and disadvantages of big-bang? Advantages:

- This approach is simple.

Disadvantages:

- It is hard to debug.
- It is not easy to isolate errors while testing.
- In this approach it is not easy to validate test results.
- After performing testing, it is impossible to form an integrated system.

**17.** What are the benefits of smoke testing?

- Integration risk is minimized.
- The quality of the end-product is improved.
- Error diagnosis and correction are simplified.
- Assessment of program is easy.

**18.** What are the conditions exists after performing validation testing?

After performing the validation testing there exists two conditions.

- The function or performance characteristics are according to the specifications and are accepted.
- The requirement specifications are derived and the deficiency list is created. The deficiencies then can be resolved by establishing the proper communication with the customer.

**19.** Distinguish between alpha and beta testing.

- Alpha and beta testing are the types of acceptance testing.
- Alpha test: The alpha testing is attesting in which the version of complete software is tested by the customer under the supervision of developer. This testing is performed at developer‟s site.
- Beta test: The beta testing is a testing in which the version of the software is tested by the customer without the developer being present. This testing is performed at customer‟s site.

**20.** What are the various types of system testing?

1. Recovery testing – is intended to check the system‟ s ability to recover from failures.
2. Security testing – verifies that system protection mechanism prevent improper penetration or data alteration.
3. Stress testing – Determines breakpoint of a system to establish maximum service level.
4. Performance testing – evaluates the run time performance of the software, especially real-time software.

**21.** What is smoke Testing? (May- 17)

The smoke testing is a kind of integration testing technique used for time critical project where in the project need to be assessed on frequent basis.

**22.** Define debugging.

Debugging is defined as the process of removal of defect. It occurs as a consequence of successful testing.

**23.** Identify the type of maintenance for each of the following:

a) Correcting the software faults

b) Adapting the change in environment.

- Corrective maintenance
- Adaptive maintenance

**24.** What is the need of Regression testing? (May-15)

Regression testing is required to test the defects that get propogated from one module to another when changes are made to existing program. Thus regression testing is used to reduce the side effects of changes

**25.** What are the common approaches in debugging?

- Brute force method: The memory dumps and run-time tracks are examined and program with write statements is loaded to obtain clues to error causes.
- Back tracking method: The source code is examined by looking backwards from symptom to potential causes of errors.
- Cause elimination method: This method uses binary partitioning to reduce the number of locations where errors can exists.

UNIT V

**1.** Define measure.

Measure is defined as a quantitative indication of the extent, amount, dimension, or size of some attribute of a product or process.

**2.** Define metrics.

Metrics is defined as the degree to which a system component, or process possesses a given attribute.

**3.** What are the types of metrics?

- Direct metrics – It refers to immediately measurable attributes. Example – Lines of code, execution speed.
- Indirect metrics – It refers to the aspects that are not immediately quantifiable or measurable. Example – functionality of a program.

**4.** What are the advantages and disadvantages of size measure? Advantages:

- Artifact of software development which is easily counted.
- Many existing methods use LOC as a key input.
- A large body of literature and data based on LOC already exists.

Disadvantages:

- This method is dependent upon the programming language.
- This method is well designed but shorter program may get suffered.
- It does not accommodate non procedural languages.
- In early stage of development it is difficult to estimate LOC.

**5.** Write short note on the various estimation techniques.

- Algorithmic cost modeling – the cost estimation is based on the size of the software.
- Expert judgement – The experts from software development and the application domain use their exoerience to predict software costs.
- Estimation by analogy – The cost of a project is computed by comparing the project to a similar project in the same application domain and then cost can be computed.
- Parkinson's law – The cost is determined by available resources rather than by objective assessment.

- Pricing to win – The project costs whatever the customer ready to spend it.

**6.** What is COCOMO model?

COnstructive COst MOdel is a cost model, which gives the estimate of number of man- months it will take to develop the software product.

**7.** Give the procedure of the Delphi method.

1. The co-ordinator presents a specification and estimation form to each expert.
2. Co-ordinator calls a group meeting in which the experts discuss estimation issues with the coordinator and each other.
3. Experts fill out forms anonymously.
4. Co-ordinator prepares and distributes a summary of the estimates.
5. The Co-ordinator then calls a group meeting.In this meeting the experts mainly discuss the points where their estimates vary widely.
6. The experts again fill out forms anonymously.
7. Again co-ordinator edits and summarizes the forms,repeating steps

5 and 6 until the co-ordinator is satisfied with the overallprediction synthesized from experts.

**8.** What is the purpose of timeline chart?

The purpose of the timeline chart is to emphasize the scope of the individual task. Hence set of tasks are given as input to the timeline chart.

**9.** What is EVA? (May-18)

Earned Value Analysis is a technique of performing quantitative analysis of the software Project.It provides a common value scale for every task of software project.It acts as a measure for software project progress.

**10.** What are the metrics computed during error tracking activity?

- Errors per requirement specification page.
- Errors per component-design level

- Errors per component-code level
- DRE-requirement analysis
- DRE-architectural analysis
- DRE-component level design
- DRE-coding.

**11.** Why software change occurs?

Software change occurs because of the following reasons. ¾_New requirements emerge when the software is used. ¾_The business environment changes. ¾_Errors need to be repaired. ¾_New equipment must be accommodated. ¾_The performance or reliability may have to be improved.

**12.** Write about software change strategies.

The software change strategies that could be applied separately or together are:

a. Software maintenance – The changes are made in the software due to requirements.
b. Architectural transformation – It is the process of changing one architecture into another form.
c. Software re-engineering – New features can be added to existing system and then the system is reconstructed for better use of it in future.

**13.** What is software maintenance?

Software maintenance is an activity in which program is modified after it has been put into use.

**14.** Define maintenance.

Maintenance is defined as the process in which changes are implemented by either modifying

the existing system‟ s architecture or by adding new components to the system.

**15.** What is Risk Management? (Dec-16)

Risk management refers to the process of making decision based on an evaluation of factors that treats to be business.

Various activities that are carried out for risk managements are

- Risk identification
- Risk Projection
- Risk Refinement
- Risk mitigation, monitoring and management.

**16.** List out the principles of Project Scheduling. (Dec-17)

- Compartmentalize
- Interdependency
- Time allocation
- Effort Validation
- Defined Responsibilities.

**17.** What are the different types of productivity estimation measures? (May-17)

- LOC based Estimation
- Function based estimation

**18.** What is architectural evolution?

Architectural evolution is the process of changing a system from a centralized architecture to a distributed architecture like client server.

1. **Explain iterative waterfall and spiral model for software life cycle and various activities in each phase.** (AU: May-15)

## i. The Iterative Waterfall Model

### SDLC - Iterative Model

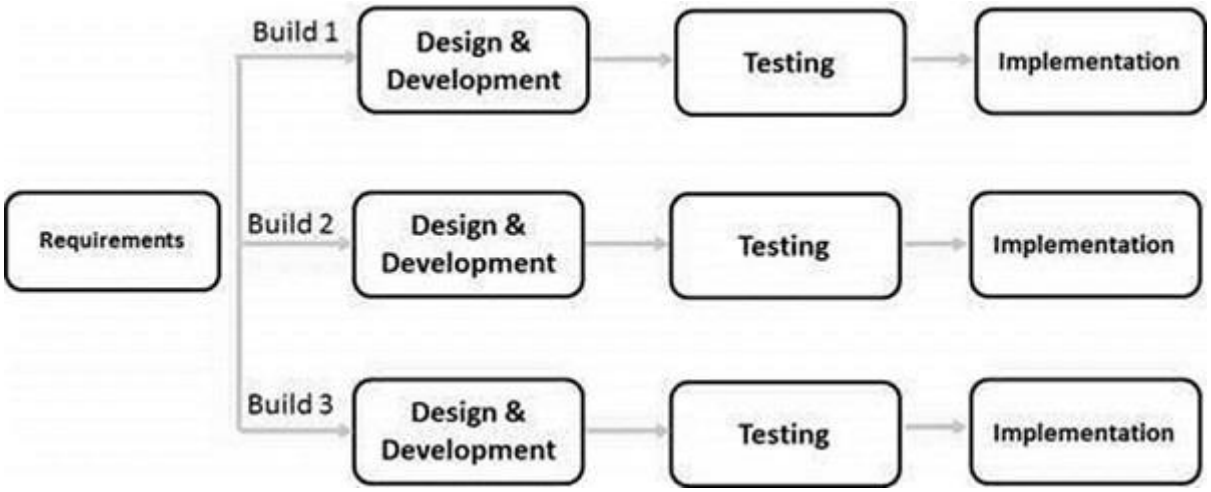
In the Iterative model, iterative process starts with a simple implementation of a small set of the software requirements and iteratively enhances the evolving versions until the complete system is implemented and ready to be deployed.

An iterative life cycle model does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software, which is then reviewed to identify further requirements. This process is then repeated, producing a new version of the software at the end of each iteration of the model.

### Iterative Model - Design

Iterative process starts with a simple implementation of a subset of the software requirements and iteratively enhances the evolving versions until the full system is implemented. At each iteration, design modifications are made and new functional capabilities are added. The basic idea behind this method is to develop a system through repeated cycles (iterative) and in smaller portions at a time (incremental).

The following illustration is a representation of the Iterative and Incremental model −




Iterative and Incremental development is a combination of both iterative design or iterative method and incremental build model for development. "During software development, more than one iteration of the software development cycle may be in progress at the same time."

This process may be described as an "evolutionary acquisition" or "incremental build" approach."

In this incremental model, the whole requirement is divided into various builds. During each iteration, the development module goes through the requirements, design, implementation and testing phases. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is ready as per the requirement.

The key to a successful use of an iterative software development lifecycle is rigorous validation of requirements, and verification & testing of each version of the software against those requirements within each cycle of the model. As the software evolves through successive cycles, tests must be repeated and extended to verify each version of the software.

### Iterative Model - Application

Like other SDLC models, Iterative and incremental development has some specific applications in the software industry. This model is most often used in the following scenarios –

- Requirements of the complete system are clearly defined and understood.
- Major requirements must be defined; however, some functionalities or requested enhancements may evolve with time.
- There is a time to the market constraint.
- A new technology is being used and is being learnt by the development team while working on the project.
- Resources with needed skill sets are not available and are planned to be used on contract basis for specific iterations.
- There are some high-risk features and goals which may change in the future.

### Iterative Model - Pros and Cons

The advantage of this model is that there is a working model of the system at a very early stage of development, which makes it easier to find functional or design flaws. Finding issues at an early stage of development enables to take corrective measures in a limited budget.

The disadvantage with this SDLC model is that it is applicable only to large and bulky software development projects. This is because it is hard to break a small software system into further small serviceable increments/modules.

The advantages of the Iterative and Incremental SDLC Model are as follows −

- Some working functionality can be developed quickly and early in the life cycle.

- Results are obtained early and periodically.
- Parallel development can be planned.
- Progress can be measured.
- Less costly to change the scope/requirements.
- Testing and debugging during smaller iteration is easy.
- Risks are identified and resolved during iteration; and each iteration is an easily managed milestone.
- Easier to manage risk - High risk part is done first.
- With every increment, operational product is delivered.
- Issues, challenges and risks identified from each increment can be utilized/applied to the next increment.
- Risk analysis is better.
- It supports changing requirements.
- Initial Operating time is less.
- Better suited for large and mission-critical projects.
- During the life cycle, software is produced early which facilitates customer evaluation and feedback.

The disadvantages of the Iterative and Incremental SDLC Model are as follows −

- More resources may be required.
- Although cost of change is lesser, but it is not very suitable for changing requirements.
- More management attention is required.
- System architecture or design issues may arise because not all requirements are gathered in the beginning of the entire life cycle.
- Defining increments may require definition of the complete system.
- Not suitable for smaller projects.
- Management complexity is more.
- End of project may not be known which is a risk.
- Highly skilled resources are required for risk analysis.
- Projects progress is highly dependent upon the risk analysis phase.

## ii.The SpiralModel

SDLC - Spiral Model

The spiral model combines the idea of iterative development with the systematic, controlled aspects of the waterfall model. This Spiral model is a combination of iterative development process model and sequential linear development model i.e. the waterfall model with a very high emphasis on risk analysis. It allows incremental releases of the product or incremental refinement through each iteration around the spiral.

Spiral Model - Design

The spiral model has four phases. A software project repeatedly passes through these phases in iterations called Spirals.

Identification

This phase starts with gathering the business requirements in the baseline spiral. In the subsequent spirals as the product matures, identification of system requirements, subsystem requirements and unit requirements are all done in this phase.

This phase also includes understanding the system requirements by continuous communication between the customer and the system analyst. At the end of the spiral, the product is deployed in the identified market.

Design

The Design phase starts with the conceptual design in the baseline spiral and involves architectural design, logical design of modules, physical product design and the final design in the subsequent spirals.

Construct or Build

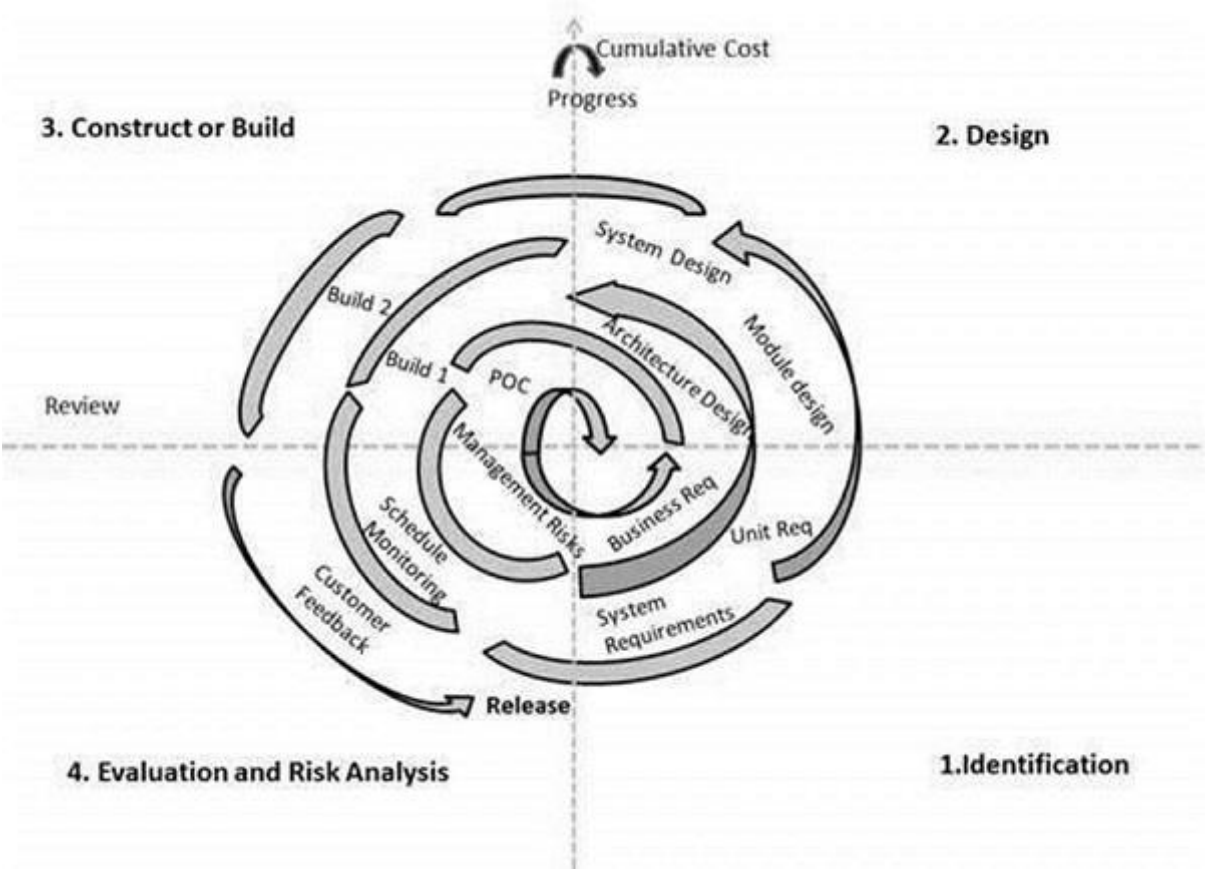
The Construct phase refers to production of the actual software product at every spiral. In the baseline spiral, when the product is just thought of and the design is being developed a POC (Proof of Concept) is developed in this phase to get customer feedback.

Then in the subsequent spirals with higher clarity on requirements and design details a working model of the software called build is produced with a version number. These builds are sent to the customer for feedback.

Evaluation and Risk Analysis

Risk Analysis includes identifying, estimating and monitoring the technical feasibility and management risks, such as schedule slippage and cost overrun. After testing the build, at the end of first iteration, the customer evaluates the software and provides feedback.

The following illustration is a representation of the Spiral Model, listing the activities in each phase.




Based on the customer evaluation, the software development process enters the next iteration and subsequently follows the linear approach to implement the feedback suggested by the customer. The process of iterations along the spiral continues throughout the life of the software.

## Spiral Model Application

The Spiral Model is widely used in the software industry as it is in sync with the natural development process of any product, i.e. learning with maturity which involves minimum risk for the customer as well as the development firms.

The following pointers explain the typical uses of a Spiral Model −

- When there is a budget constraint and risk evaluation is important.
- For medium to high-risk projects.
- Long-term project commitment because of potential changes to economic priorities as the requirements change with time.
- Customer is not sure of their requirements which is usually the case.

- Requirements are complex and need evaluation to get clarity.
- New product line which should be released in phases to get enough customer feedback.
- Significant changes are expected in the product during the development cycle.

Spiral Model - Pros and Cons

The advantage of spiral lifecycle model is that it allows elements of the product to be added in, when they become available or known. This assures that there is no conflict with previous requirements and design.

This method is consistent with approaches that have multiple software builds and releases which allows making an orderly transition to a maintenance activity. Another positive aspect of this method is that the spiral model forces an early user involvement in the system development effort.

On the other side, it takes a very strict management to complete such products and there is a risk of running the spiral in an indefinite loop. So, the discipline of change and the extent of taking change requests is very important to develop and deploy the product successfully.

The advantages of the Spiral SDLC Model are as follows −

- Changing requirements can be accommodated.
- Allows extensive use of prototypes.
- Requirements can be captured more accurately.
- Users see the system early.
- Development can be divided into smaller parts and the risky parts can be developed earlier which helps in better risk management.

The disadvantages of the Spiral SDLC Model are as follows −

- Management is more complex.
- End of the project may not be known early.
- Not suitable for small or low risk projects and could be expensive for small projects.
- Process is complex
- Spiral may go on indefinitely.
- Large number of intermediate stages requires excessive documentation.

2. **Explain about the software process model that is refined and expanded in later releases**

A software process (also knows as software methodology) is a set of related activities that leads to the production of the software. These activities may involve the development of the software from the scratch, or, modifying an existing system.Any software process must include the following four activities:

**3. Explain in detail about the software process.**

Software Process:
A software process (also known as software methodology) is a set of related activities that leads to the production of the software. These activities may involve the development of the software from the scratch, or, modifying an existing system.Any software process must include the following four activities:

1. **Software specification** (or requirements engineering): Define the main functionalities of the software and the constrains around them.

2. S**oftware design and implementation**: The software is to be designed and programmed.

3. **Software verification and validation**: The software must conforms to it's specification and meets

the customer needs.

4. **Software evolution** (software maintenance):
The software is being modified to meet customer and market requirements changes. In practice, they include sub-activities such as requirements validation, architectural design, unit testing, …etc.There are also **supporting activities** such as configuration and change management, quality assurance, project management, user experience.

Along with **other activities** aim to **improve** the above activities by introducing new techniques, tools, following the best practice, process standardization (so the diversity of software processes is reduced), etc.When we talk about a process, we usually talk about the activities in it. However, a process also includes the process description, which includes:

1. **Products**: The outcomes of the an activity. For example, the outcome of architectural designs maybe a model for the software architecture.

2. **Roles**: The responsibilities of the people involved in the process. For example, the project manager, programmer, etc.

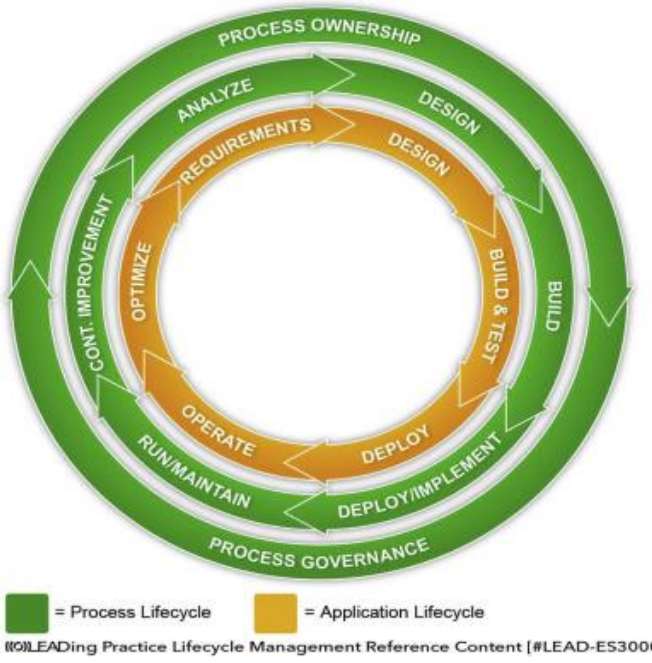
3. **Pre and post conditions**: The conditions that must be true before and after an activity. For example, the pre condition of the architectural design is the requirements have been approved by the customer, while the post condition is the diagrams describing the architectural have been reviewed.
Software process is complex, it relies on making decisions. There's no ideal process and most organizations have developed their own software process.
For example, an organization works on critical systems has a very structured process, while with business systems, with rapidly changing requirements, a less formal, flexible process is likely to be more effective.

4. Explain in detail about the life cycle process.

Process Life Cycle

The view of a process life cycle is not new. Several authors[4,5–8] have looked at the problem of defining these cycles and proposed a number of different approaches; for example, Verner proposed a process life cycle containing seven individual stages to an iteration: Analyze → Design → Build/Develop → Deploy → Operate → Maintain/Continuous Improvement.

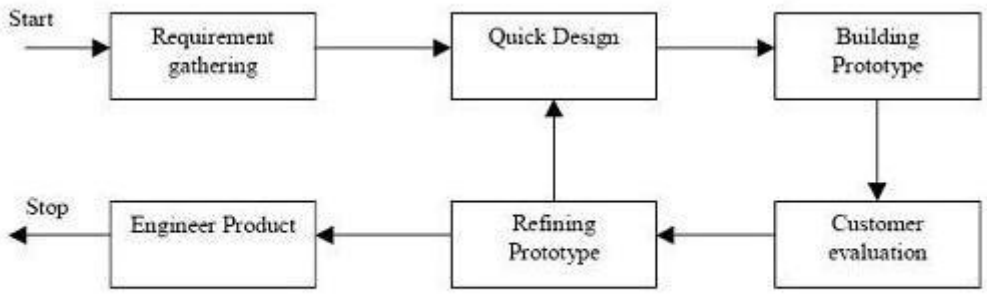
However, for our working examples we will use the definition of the process life cycle (see Figure 2) as defined by the LEADing Practice framework[9] because the LEAD standards offer a paradigm shift in the goal of producing a truly open all-encompassing standard (LEAD standards include interfaces to other frameworks, methods, and approaches such as TOGAF, Zachman, FEAF, ITIL, Prince2, COBIT, and DNEAF).[10] For our working examples, we will use the definition of the process life cycle discussed in the chapter "BPM Life Cycle."




5. **Discuss the prototyping model. What is the effect of designing a prototype on the overall cost of the software project?** (AU: May-16)

The prototypes are usually not complete systems and many of the details are not built in the prototype. The goal is to provide a system with overall functionality.

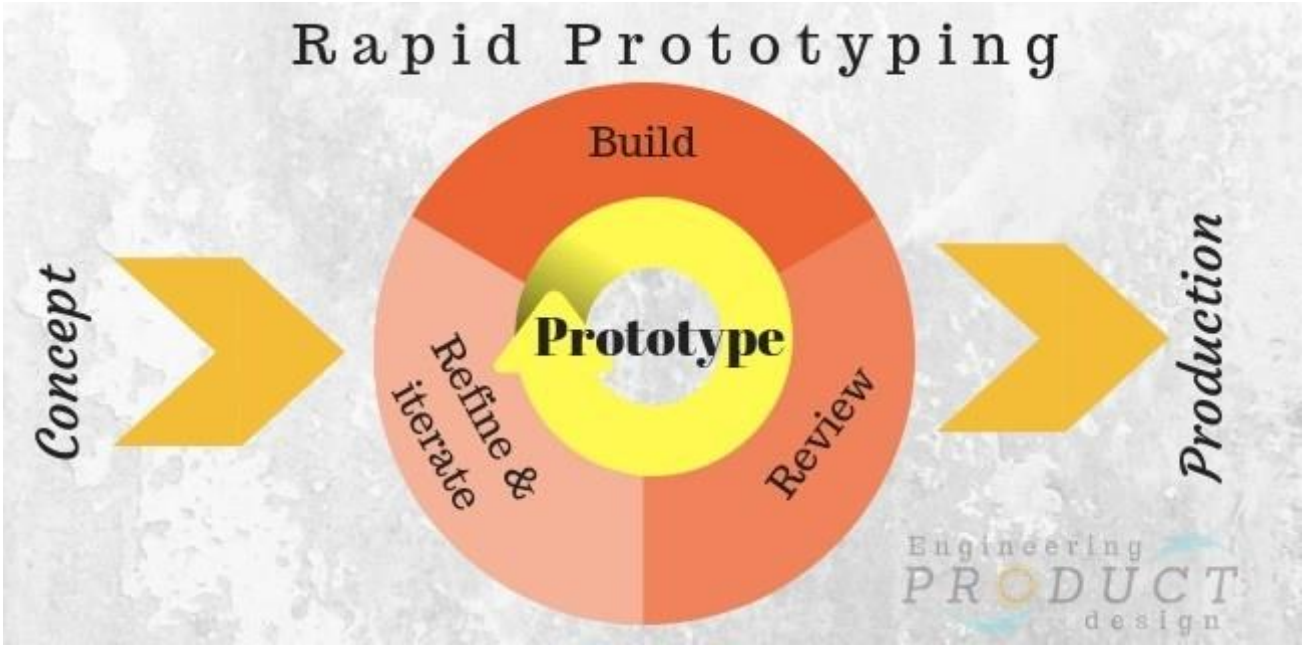
**Diagram of Prototype model:**




*Prototyping Model*

**6. Explain about rapid prototyping techniques.**

**Rapid prototyping**technologies are **techniques** used to create a real-scale model of an object in a short lead time, using CAD software. They include 3D printing, subtractive manufacturing (turning, milling, drilling) and casting.

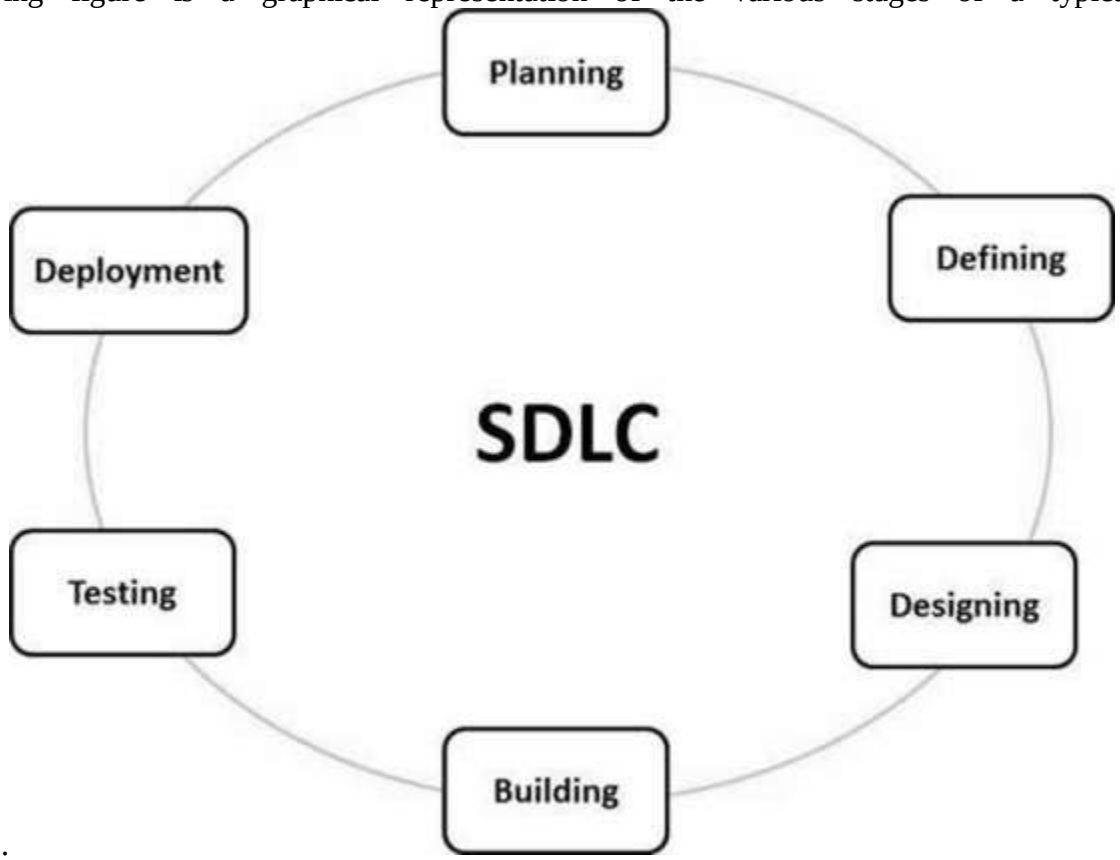



**7. A software project which is considered to be very simple and the customer in position of giving all the requirements at the initial stage, which process model would you prefer for developing the project?**

- SDLC is the acronym of Software Development Life Cycle.
- It is also called as Software Development Process.
- SDLC is a framework defining tasks performed at each step in the software development process.

SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process.The

following figure is a graphical representation of the various stages of a typical




SDLC.

A typical Software Development Life Cycle consists of the following stages −

Stage 1: Planning and Requirement Analysis

Requirement analysis is the most important and fundamental stage in SDLC. It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts in the industry. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas.

Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage. The outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

Stage 2: Defining Requirements

Once the requirement analysis is done the next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts. This is

done through an **SRS (Software Requirement Specification)** document which consists of all the product requirements to be designed and developed during the project life cycle.

Stage 3: Designing the Product Architecture

SRS is the reference for product architects to come out with the best architecture for the product to be developed. Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented in a DDS - Design Document Specification.

This DDS is reviewed by all the important stakeholders and based on various parameters as risk assessment, product robustness, design modularity, budget and time constraints, the best design approach is selected for the product.

A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third party modules (if any). The internal design of all the modules of the proposed architecture should be clearly defined with the minutest of the details in DDS.

Stage 4: Building or Developing the Product

In this stage of SDLC the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle.

Developers must follow the coding guidelines defined by their organization and programming tools like compilers, interpreters, debuggers, etc. are used to generate the code. Different high level programming languages such as C, C++, Pascal, Java and PHP are used for coding. The programming language is chosen with respect to the type of software being developed.

Stage 5: Testing the Product

This stage is usually a subset of all the stages as in the modern SDLC models, the testing activities are mostly involved in all the stages of SDLC. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards defined in the SRS.

Stage 6: Deployment in the Market and Maintenance

Once the product is tested and ready to be deployed it is released formally in the appropriate market. Sometimes product deployment happens in stages as per the business strategy of that organization. The product may first be released in a limited segment and tested in the real business environment (UAT- User acceptance testing).

Then based on the feedback, the product may be released as it is or with suggested enhancements in the targeting market segment. After the product is released in the market, its maintenance is done for the existing customer base.

8. **Describe V-model verification phase and the validation phase.**

## SDLC - V-Model

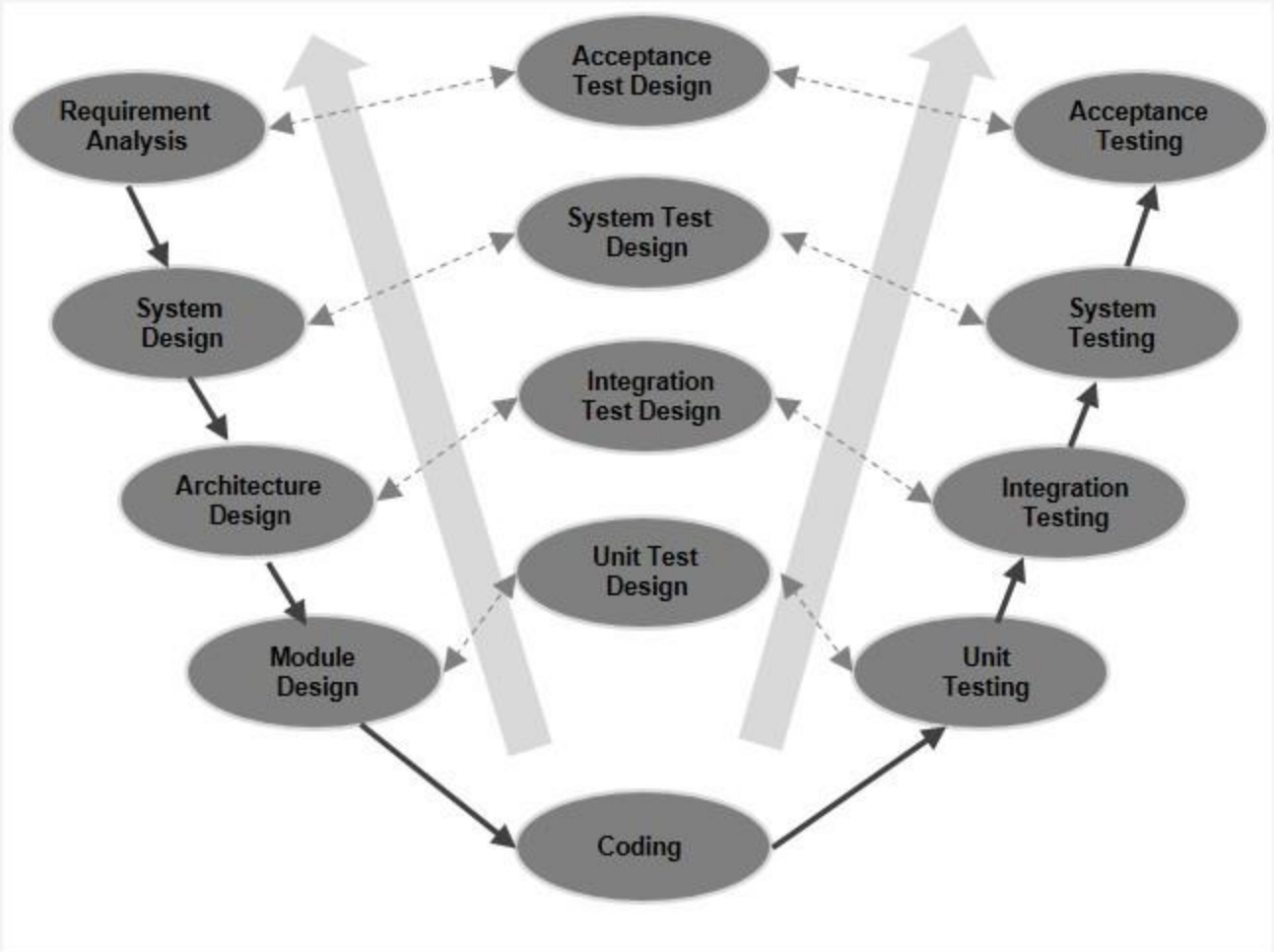
The V-model is an SDLC model where execution of processes happens in a sequential manner in a V-shape. It is also known as **Verification and Validation model**.

The V-Model is an extension of the waterfall model and is based on the association of a testing phase for each corresponding development stage. This means that for every single phase in the development cycle, there is a directly associated testing phase. This is a highly-disciplined model and the next phase starts only after completion of the previous phase.

### V-Model - Design

Under the V-Model, the corresponding testing phase of the development phase is planned in parallel. So, there are Verification phases on one side of the 'V' and Validation phases on the other side. The Coding Phase joins the two sides of the V-Model.

The following illustration depicts the different phases in a V-Model of the SDLC.



## V-Model - Verification Phases

There are several Verification phases in the V-Model, each of these are explained in detail below.

### Business Requirement Analysis

This is the first phase in the development cycle where the product requirements are understood from the customer's perspective. This phase involves detailed communication with the customer to understand his expectations and exact requirement. This is a very important activity and needs to be managed well, as most of the customers are not sure about what exactly they need. The **acceptance test design planning** is done at this stage as business requirements can be used as an input for acceptance testing.

### System Design

Once you have the clear and detailed product requirements, it is time to design the complete system. The system design will have the understanding and detailing the complete hardware and communication setup for the product under development. The system test plan is developed based on the system design. Doing this at an earlier stage leaves more time for the actual test execution later.

### Architectural Design

Architectural specifications are understood and designed in this phase. Usually more than one technical approach is proposed and based on the technical and financial feasibility the final decision is taken. The system design is broken down further into modules taking up different functionality. This is also referred to as **High Level Design (HLD)**.

The data transfer and communication between the internal modules and with the outside world (other systems) is clearly understood and defined in this stage. With this information, integration tests can be designed and documented during this stage.

### Module Design

In this phase, the detailed internal design for all the system modules is specified, referred to as **Low Level Design (LLD)**. It is important that the design is compatible with the other modules in the system architecture and the other external systems. The unit tests are an essential part of any development process and helps eliminate the maximum faults and errors at a very early stage. These unit tests can be designed at this stage based on the internal module designs.

## Coding Phase

The actual coding of the system modules designed in the design phase is taken up in the Coding phase. The best suitable programming language is decided based on the system and architectural requirements.

The coding is performed based on the coding guidelines and standards. The code goes through numerous code reviews and is optimized for best performance before the final build is checked into the repository.

## Validation Phases

The different Validation Phases in a V-Model are explained in detail below.

### Unit Testing

Unit tests designed in the module design phase are executed on the code during this validation phase. Unit testing is the testing at code level and helps eliminate bugs at an early stage, though all defects cannot be uncovered by unit testing.

### Integration Testing

Integration testing is associated with the architectural design phase. Integration tests are performed to test the coexistence and communication of the internal modules within the system.

### System Testing

System testing is directly associated with the system design phase. System tests check the entire system functionality and the communication of the system under development with external systems. Most of the software and hardware compatibility issues can be uncovered during this system test execution.

### Acceptance Testing

Acceptance testing is associated with the business requirement analysis phase and involves testing the product in user environment. Acceptance tests uncover the compatibility issues with the other systems available in the user environment. It also discovers the non-functional issues such as load and performance defects in the actual user environment.

## V- Model – Application

V- Model application is almost the same as the waterfall model, as both the models are of sequential type. Requirements have to be very clear before the project starts, because it is usually expensive to go back and make changes. This model is used in the medical development field, as it is strictly a disciplined domain.

The following pointers are some of the most suitable scenarios to use the V-Model application.

- Requirements are well defined, clearly documented and fixed.

- Product definition is stable.
- Technology is not dynamic and is well understood by the project team.
- There are no ambiguous or undefined requirements.
- The project is short.

V-Model - Pros and Cons

The advantage of the V-Model method is that it is very easy to understand and apply. The simplicity of this model also makes it easier to manage. The disadvantage is that the model is not flexible to changes and just in case there is a requirement change, which is very common in today's dynamic world, it becomes very expensive to make the change.

The advantages of the V-Model method are as follows −

- This is a highly-disciplined model and Phases are completed one at a time.
- Works well for smaller projects where requirements are very well understood.
- Simple and easy to understand and use.
- Easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.

The disadvantages of the V-Model method are as follows −

- High risk and uncertainty.
- Not a good model for complex and object-oriented projects.
- Poor model for long and ongoing projects.
- Not suitable for the projects where requirements are at a moderate to high risk of changing.
- Once an application is in the testing stage, it is difficult to go back and change a functionality.
- No working software is produced until late during the life cycle.

## 9. **Analyze the Agile development model and its principles.(Nov/Dec 2016)**

### SDLC - Agile Model

Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Agile Methods break the product into small incremental builds. These builds are provided in

iterations. Each iteration typically lasts from about one to three weeks. Every iteration involves cross functional teams working simultaneously on various areas like −

- Planning
- Requirements Analysis
- Design
- Coding
- Unit Testing and
- Acceptance Testing.

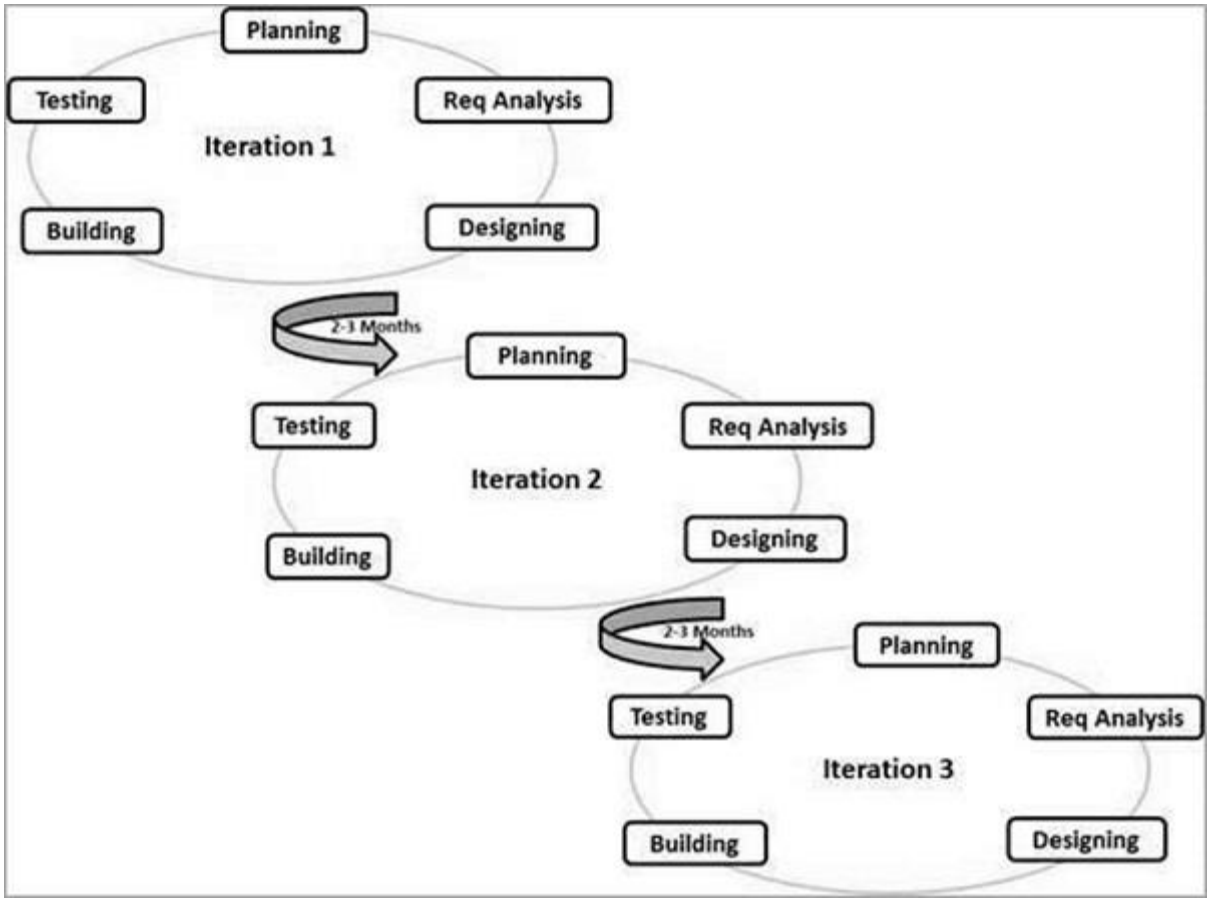
At the end of the iteration, a working product is displayed to the customer and important stakeholders.

## What is Agile?

Agile model believes that every project needs to be handled differently and the existing methods need to be tailored to best suit the project requirements. In Agile, the tasks are divided to time boxes (small time frames) to deliver specific features for a release.

Iterative approach is taken and working software build is delivered after each iteration. Each build is incremental in terms of features; the final build holds all the features required by the customer.

Here is a graphical illustration of the Agile Model −




The Agile thought process had started early in the software development and started becoming popular with time due to its flexibility and adaptability.

The most popular Agile methods include Rational Unified Process (1994), Scrum (1995), Crystal Clear, Extreme Programming (1996), Adaptive Software Development, Feature Driven Development, and Dynamic Systems Development Method (DSDM) (1995). These are now collectively referred to as **Agile Methodologies**, after the Agile Manifesto was published in 2001.

Following are the Agile Manifesto principles −

- **Individuals and interactions** − In Agile development, self-organization and motivation are important, as are interactions like co-location and pair programming.
- **Working software** − Demo working software is considered the best means of communication with the customers to understand their requirements, instead of just depending on documentation.
- **Customer collaboration** − As the requirements cannot be gathered completely in the beginning of the project due to various factors, continuous customer interaction is very important to get proper product requirements.

- **Responding to change** − Agile Development is focused on quick responses to change and continuous development.

## Agile Vs Traditional SDLC Models

Agile is based on the **adaptive software development methods**, whereas the traditional SDLC models like the waterfall model is based on a predictive approach. Predictive teams in the traditional SDLC models usually work with detailed planning and have a complete forecast of the exact tasks and features to be delivered in the next few months or during the product life cycle.

Predictive methods entirely depend on the **requirement analysis and planning** done in the beginning of cycle. Any changes to be incorporated go through a strict change control management and prioritization.

Agile uses an **adaptive approach** where there is no detailed planning and there is clarity on future tasks only in respect of what features need to be developed. There is feature driven development and the team adapts to the changing product requirements dynamically. The product is tested very frequently, through the release iterations, minimizing the risk of any major failures in future.

**Customer Interaction** is the backbone of this Agile methodology, and open communication with minimum documentation are the typical features of Agile development environment. The agile teams work in close collaboration with each other and are most often located in the same geographical location.

## Agile Model - Pros and Cons

Agile methods are being widely accepted in the software world recently. However, this method may not always be suitable for all products. Here are some pros and cons of the Agile model.

The advantages of the Agile Model are as follows −

- Is a very realistic approach to software development.
- Promotes teamwork and cross training.
- Functionality can be developed rapidly and demonstrated.
- Resource requirements are minimum.
- Suitable for fixed or changing requirements
- Delivers early partial working solutions.
- Good model for environments that change steadily.

- Minimal rules, documentation easily employed.
- Enables concurrent development and delivery within an overall planned context.
- Little or no planning required.
- Easy to manage.
- Gives flexibility to developers.

The disadvantages of the Agile Model are as follows −

- Not suitable for handling complex dependencies.
- More risk of sustainability, maintainability and extensibility.
- An overall plan, an agile leader and agile PM practice is a must without which it will not work.
- Strict delivery management dictates the scope, functionality to be delivered, and adjustments to meet the deadlines.
- Depends heavily on customer interaction, so if customer is not clear, team can be driven in the wrong direction.
- There is a very high individual dependency, since there is minimum documentation generated.
- Transfer of technology to new team members may be quite challenging due to lack of documentation.

**10. Briefly describe about RAD model and its applications.**

## SDLC - RAD Model

The **RAD (Rapid Application Development)** model is based on prototyping and iterative development with no specific planning involved. The process of writing the software itself involves the planning required for developing the product.

Rapid Application Development focuses on gathering customer requirements through workshops or focus groups, early testing of the prototypes by the customer using iterative concept, reuse of the existing prototypes (components), continuous integration and rapid delivery.

### What is RAD?

Rapid application development is a software development methodology that uses minimal planning in favor of rapid prototyping. A prototype is a working model that is functionally equivalent to a component of the product.

In the RAD model, the functional modules are developed in parallel as prototypes and are integrated to make the complete product for faster product delivery. Since there is no detailed preplanning, it makes it easier to incorporate the changes within the development process.

RAD projects follow iterative and incremental model and have small teams comprising of developers, domain experts, customer representatives and other IT resources working progressively on their component or prototype.

The most important aspect for this model to be successful is to make sure that the prototypes developed are reusable.

## RAD Model Design

RAD model distributes the analysis, design, build and test phases into a series of short, iterative development cycles.

Following are the various phases of the RAD Model −

### Business Modeling

The business model for the product under development is designed in terms of flow of information and the distribution of information between various business channels. A complete business analysis is performed to find the vital information for business, how it can be obtained, how and when is the information processed and what are the factors driving successful flow of information.

### Data Modeling

The information gathered in the Business Modeling phase is reviewed and analyzed to form sets of data objects vital for the business. The attributes of all data sets is identified and defined. The relation between these data objects are established and defined in detail in relevance to the business model.

### Process Modeling

The data object sets defined in the Data Modeling phase are converted to establish the business information flow needed to achieve specific business objectives as per the business model. The process model for any changes or enhancements to the data object sets is defined in this phase. Process descriptions for adding, deleting, retrieving or modifying a data object are given.

### Application Generation

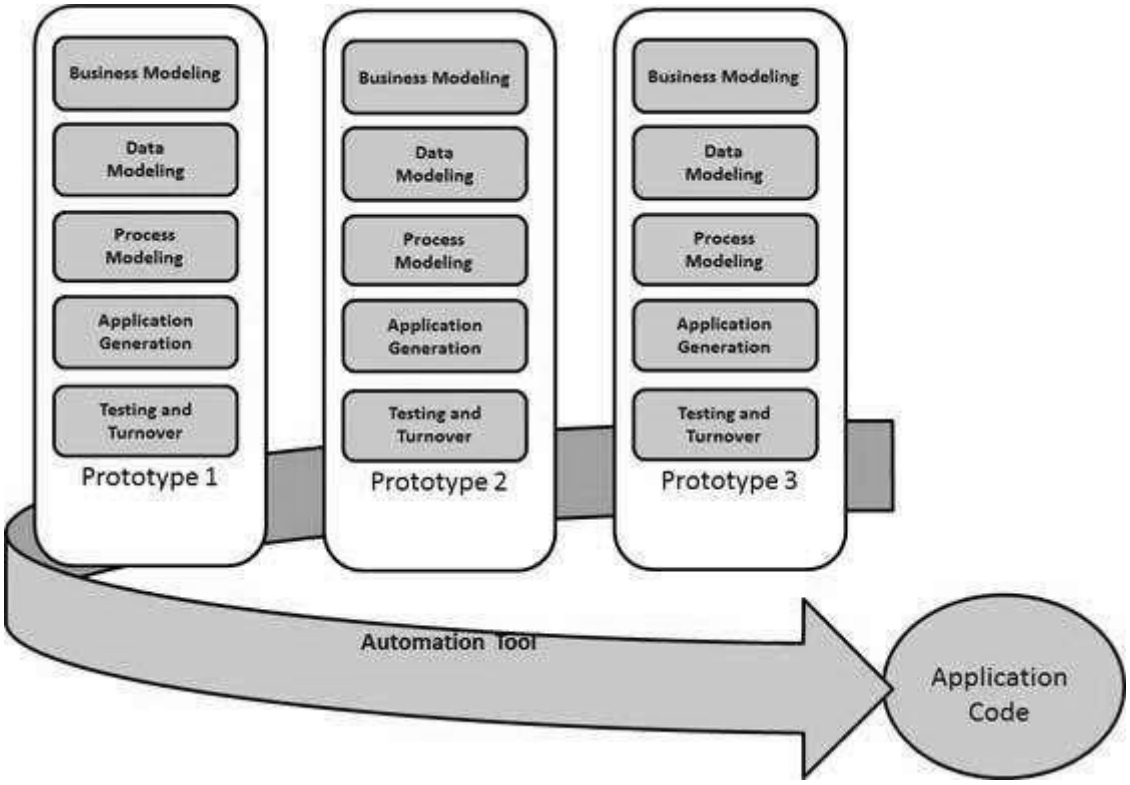
The actual system is built and coding is done by using automation tools to convert process and data models into actual prototypes.

### Testing and Turnover

The overall testing time is reduced in the RAD model as the prototypes are independently tested during every iteration. However, the data flow and the interfaces between all the

components need to be thoroughly tested with complete test coverage. Since most of the programming components have already been tested, it reduces the risk of any major issues.

The following illustration describes the RAD Model in detail.




RAD Model Vs Traditional SDLC

The traditional SDLC follows a rigid process models with high emphasis on requirement analysis and gathering before the coding starts. It puts pressure on the customer to sign off the requirements before the project starts and the customer doesn't get the feel of the product as there is no working build available for a long time.

The customer may need some changes after he gets to see the software. However, the change process is quite rigid and it may not be feasible to incorporate major changes in the product in the traditional SDLC.

The RAD model focuses on iterative and incremental delivery of working models to the customer. This results in rapid delivery to the customer and customer involvement during the complete development cycle of product reducing the risk of non-conformance with the actual user requirements.

RAD Model - Application

RAD model can be applied successfully to the projects in which clear modularization is possible. If the project cannot be broken into modules, RAD may fail.

The following pointers describe the typical scenarios where RAD can be used −

- RAD should be used only when a system can be modularized to be delivered in an incremental manner.
- It should be used if there is a high availability of designers for modeling.
- It should be used only if the budget permits use of automated code generating tools.
- RAD SDLC model should be chosen only if domain experts are available with relevant business knowledge.
- Should be used where the requirements change during the project and working prototypes are to be presented to customer in small iterations of 2-3 months.

RAD Model - Pros and Cons

RAD model enables rapid delivery as it reduces the overall development time due to the reusability of the components and parallel development. RAD works well only if high skilled engineers are available and the customer is also committed to achieve the targeted prototype in the given time frame. If there is commitment lacking on either side the model may fail.

The advantages of the RAD Model are as follows −

- Changing requirements can be accommodated.
- Progress can be measured.
- Iteration time can be short with use of powerful RAD tools.
- Productivity with fewer people in a short time.
- Reduced development time.
- Increases reusability of components.
- Quick initial reviews occur.
- Encourages customer feedback.
- Integration from very beginning solves a lot of integration issues.

The disadvantages of the RAD Model are as follows −

- Dependency on technically strong team members for identifying business requirements.
- Only system that can be modularized can be built using RAD.
- Requires highly skilled developers/designers.
- High dependency on modeling skills.

- Inapplicable to cheaper projects as cost of modeling and automated code generation is very high.
- Management complexity is more.
- Suitable for systems that are component based and scalable.
- Requires user involvement throughout the life cycle.
- Suitable for project requiring shorter development times.

## UNIT II

## REQUIREMENTS ANALYSIS AND SPECIFICATION

1. Explain in detail about data modeling.
2. Explain in detail about Functional Modeling.
3. Explain in detail about Structural Modeling.
4. Explain the merits used for specifying non functional requirements. (AU: May-13, May 16)
5. Explain the organization of SRS and highlight the importance of each subsection.
6. What is requirement engineering? Explain in detail the various processes in requirement engineering.
   (AU: May-17)
7. An independent truck company wants to track and record its driver driving habits. For this purpose the company has rented 800 phone numbers and has printed the numbers in the front, back and sides of all trucks owned by the company. Next to the 800 numbers a massage is written "PLEASE REPORT ANY DRIVER OR TRUCK PROBLEM BY CALLING THIS NUMBER". The hacking company waits for you to develop a system that:
   a. Collect information from caller about driver performance and behavior as well as truck condition,
   b. Generates daily and monthly reports for each driver and truck management
   c. Reports problems that require immediate action to an on-duty manager.

   Analyze the problems that statement and list major functions to be incorporated with the SRS document.
8. Explain the feasibility studies. What are the outcomes? Does it have implicit or explicit effects on software requirement collection?
   (AU: May-17)
9. What is requirement elicitation? Briefly describe the various activities performed in the requirements elicitation phase with an example of a watch system that facilitates to set time and alarm.
   (AU: Dec-16, May-18)
10. Design DFD for library management system for level 0 DFD and level 1 DFD
11. Consider an online book stores. It accepts individual/bulk orders, process payments, triggers delivery of the books. Some of the major features of the system include:
    a. Order books

b. User friendly online shopping cart function
c. Create, view, modify and delete books to be sold
d. To store inventory and sales information in database
e. To provide an efficient inventory system
f. Register for book payment options
g. Request book delivery
h. Add a wish list
i. Place request for books not available
j. To be able to print invoices to members and print a set of summary reports
k. Internet access

Analyze the system using the context diagram and level 1 DFD for the system. Explain the components of DFD

12. Consider the process of ordering a pizza over the phone. Draw the use case diagram and also sketch the activity diagram representing each step of the process, from the moment you pick up the phone to the point where you start eating the pizza. Include activities that others need to perform. Add exception handling to the activity diagram you developed. Consider at-least two exceptions (Example Delivery person wrote down wrong address, deliver person brings wrong pizza)
13. What is the purpose of DFD? What are the components of DFD? Construct DFD for the following system: An online shopping system for XYZ provides many services and benefits to its members and staffs manually handle the purchasing information with the use of basic office software, such as Microsoft office word and excel. It may results in having mistakes easily and the process is very inconvenient. XYZ needs an online shopping system has five key features:
    a. To provide the user friendly online shopping cart function to members to replace hardcopy ordering form;
    b. To store inventory and sales information in database to reduce the human mistakes, increase accuracy and enhance the flexibility of information processing;
    c. To provide an efficient inventory system which can help the XYZ staffs to gain enough information to update the inventory;
    d. To be able to print invoices to members and print a set of summary reports for XYZ's internal usage;
    e. To design the system that is easy to maintain and upgrade.

## UNIT III

1. Explain about the various design concepts considered during the design. (AU: Dec-17)
2. Discuss in detail about the design process in software development process.
3. What is software architecture? Describe in detail different types of software architectures with illustrations. (AU: May-17)
4. Discuss the design heuristics for effective modularity design. (AU: May-16)
5. What is software architecture? Describe in detail different software architectural styles with examples. (AU: May-18)
6. Explain the design steps of the transform mapping.
7. Explain the design steps in transaction mapping.
8. Discuss about user interface design of software with an example and neat sketch. (AU: Dec-17)
9. For an inventory system show the architectural and component design.

## UNIT IV

1. Explain the types of software testing.
2. What is Black box testing? Explain the different types of black box testing strategies. Explain by considering suitable examples. (AU: Dec-16)
3. What is white box testing? Explain how various types of loops are tested. (AU: Dec-17)
4. Given a set of ‘n’ numbers, write an algorithm that finds whether the given number is positive, negative, zero, even or odd. Finally, the total number in each category is also printed. Draw the flow graph and enumerate paths for testing. Determine the number of independent paths using cyclomatic complexity.
5. Consider the pseudo code for simple subtraction given below
    a. Program simple subtraction
    b. Input (x, y)
    c. Output (x)
    d. Output (y)
    e. If x>y then do
    f. x-y=z
    g. else y-x=z
    h. endif
    i. Output (z)
    j. Output “End Program”

    Perform basis path testing and generate test cases.
6. Explain about the software testing strategies.
7. Explain in detail about Integration testing.
8. Explain in detail about SCM.
9. Compare and Contrast alpha and beta testing. (AU: May-16)

**UNIT V**

1. Explain about software cost estimation.
2. If team A found 342 errors prior to release of software and team B found 182 errors. What additional measures and metrics needed to find out if teams have removed the errors effectively? Explain.
3. Describe in detail about COCOMO model for software cost estimation. Illustrate considering a suitable example. (AU: May-17)
4. Describe in detail COCOMO model for software cost estimation. Use it to estimate effort required to build software for a simple ATM that produces 12 screens, 10 reports and has 80 software components. Assume average complexity and average developer maturity. Use application composition model with object points.
5. Explain in detail about Delphi Method. Procedure
6. Explain in detail about software Maintenance.
7. Explain about CASE tools.
8. Study of requirement for ABC project has produced following results: Need for 7 inputs, 10 outputs, 6 inquiries, 17 files and 4 external interfaces. Input and external interface function point attributes are of average complexity and all other function points attributes are of low complexity.

   Determine adjusted function points assuming complexity adjustment value is 32.
9. An application has the following:

   10 low external inputs, 8 high external inputs, 13 low internal logic files, 17 high external interface files, 11 average external inquiries and complexity adjustment factor of 1.10. what are unadjusted and adjusted function point counts?
10. How functional point analysis methodology is is applied in estimation of software size? Explain why FPA methodology is better than LOC methodology? (AU: May-17, May-18)
11. Suppose you have a budgeted cost of a project as Rs.9, 00, 000. The project is to be completed in 9 months. After a month, you have completed 10 percent of the project at a total expense of Rs.1, 00, 000. The planned cost completion should have 15 percent. You need to determine whether the project is on-time and on-budget? Use earned value analysis approach and interpret.

    (Reference: Page No-5-42, Example: 5.6.3)

# OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT-I

## INTRODUCTION

### PART-A (2MARKS)

1. Mention the classification of air pollutants. **(May/June2016)**
2. List two effects of air pollutants on materials. **(May/June2016)**
3. Name the method to measure concentration of $SO_2$ and $NO_2$. **(May/June2012)**
4. Brief the effect of carbon monoxide on human beings. **(May/June2012,Nov/Dec2012)**
5. Define Isokinetic conditions. **(Nov/Dec2012**)
6. Define primary and secondary air pollutants. Give examples**. (Nov/Dec2011)**
7. What is a representative sample? **(Nov/Dec2011,Nov/Dec2013)**
8. What do you mean by secondary pollutants state an example?

**(May/June2013,May/June2012,Nov/Dec2013,Nov/Dec2012)**

9. What is the purpose of measuring stack gas temperature and pressure in stack sampling?

**(May/June2013)**

10. What is Iso-kinetic sampling? **(May/June2012)**
11. Write a short notes on aerosol. **(May/June2013)**
12. Mention the objectives of air sampling**. (Nov/Dec2012)**
13. Name three important oxides of nitrogen responsible of air pollution. **(May/June2013)**
14. List out the ozone depleting compounds**. (Nov/Dec2013)**
15. Write the effects of air pollution on plants. **(May/June2013)**
16. Define mist. **(May/June2013**)
17. Differentiate pollution and pollutant. **(Nov/Dec2015)**
18. State the basic principles of sampling. **(Nov/Dec2015,May/June2016)**
19. What is global warming? **(May/June2013)**
20. What are greenhouse gases? Give examples. **(Nov/Dec2012)**
21. List out the analysis of air pollutants. **(May/June2014)**
22. Name some of the natural and manmade sources of air pollutants.
23. State the effects of air pollution on aquatic life.
24. What is acid rain?
25. What are the physical effects of air pollution?

### PART-B (16MARKS)

1. List out the various air pollutants, their sources and its effect on both plant and human being. (**May/June2012, May/June2013, Nov/Dec2011,Nov/Dec2013)**
2. Explain the detail procedure to find out the concentration of RSPM,SPM and gaseous pollutant in ambient air using High Volume Sampler. **(May/June2012,Nov/Dec2013)**
3. Write the effects of air pollution on human beings.

**(May/June2016,May/June2013,Nov/Dec2013)**

4. What is global warming? Discuss its occurrence pollutants responsible and impacts. (**May/June2013,May/June2012,Nov/Dec2013)**
5. Write the causes, effects and control of ozone layer depletion**.(May/June2016)**
6. Explain the economical impacts of air pollution. Give example.

**(Nov/Dec2011,Nov/Dec2012)**

**UNIT-II**

## UNIT – II

## METEOROLOGY

### PART-A (2MARKS)

1. Write the types of inversion. **(May/June2016)**
2. Mention the purpose of wind rose diagram. **(May/June2016,Nov/Dec2015)**
3. List out the meteorological factors in the content of air pollution. **(May/June2012)**
4. What is the prime mechanism to disperse air pollution? **(May/June2012)**
5. Define atmospheric stability? **(Nov/Dec2012,May/June2012)**
6. What are dispersion models? **(Nov/Dec2012,May/June2012)**
7. What is mixing height? **(Nov/Dec2011,May/June2014)**
8. Define plume rise. **(Nov/Dec2011)**
9. What is planetary boundary layer? **(May/June2013**)
10. What is turbulence and how it is formed? **(May/June2013)**
11. Express Gaussian dispersion model**. (Nov/Dec2012)**
12. State the types of dispersion model. **(May/June2013)**
13. What are the types of plume? **(May/June2016)**
14. How to winds play its role in air pollution? **(May/June2012)**
15. Define plume. **(Nov/Dec2012)**
16. What are the objectives of studying the meteorological factors?
17. Define negative lapse rate.
18. What is lapse rate?
19. What are the factors influencing plume behaviour?
20. Name the layers of the atmosphere from the lowest to highest.
21. Define radiation inversions.
22. Differentiate dry and wet adiabatic lapse rates.
23. What are the types of wind?
24. Define ELR.
25. Define pollution rose.

### PART-B (16MARKS)

1. What are the meteorological factors influencing the air pollution? Explain briefly.

**(Nov/Dec2011,Nov/Dec2012,May/June2013)**

2. With neat sketch, explain effect of lapse rate on plume behaviour.

**(May/June2016,May/June2012)**

3. Explain Gaussian dispersion model with assumption, merits and demerits.

**(May/June2012,Nov/Dec2012,May/June2016)**

4. What are dispersion models? State the types and explain them.

**(May/June2013,Nov/Dec2015)**

5. Explain the plume behaviour form a stack with respect to the different prevailing lapse rate. Use neat sketches. **(May/June2012,Nov/Dec2015)**
6. Explain the factors affecting dispersion of air pollutants**. (May/June2016)**

UNIT-III

# CONTROL OF PARTICULATE CONTAMINANTS

## PART-A (2MARKS)

1. Write the equipments used to control particulate matter. **(May/June2012,May/June2016)**
2. Write the formula to calculate the efficiency in gravitation settling chamber. **(May/June2016)**
3. Define adsorption. **(May/June2012)**
4. What is the pollution control equipment? **(Nov/Dec2012)**
5. How does condensation bring up pollution control**? (Nov/Dec2012)**
6. Write the principle of ESP. **(Nov/Dec2011)**
7. Differentiate between adsorption and absorption. **(Nov/Dec2011,Nov/Dec2015)**
8. What is meant by pollution control by fugitive emission containment? **(May/June2013)**
9. State the particulate size which can be removed in a settling chamber and an ESP.

**(May/June2013)**

10. How combustion brings pollution control? **(May/June2012)**
11. What is wet scrubbing? **(May/June2012)**
12. List the principles of control of particulate matter. **(Nov/Dec2015)**
13. What is scrubbing? **(Nov/Dec2012)**
14. Define inertial separators. **(May/June2013)**
15. Merits and demerits of filtration process use bag house filter. **(Nov/Dec2012)**
16. What are the air pollution control strategies? **(Nov/Dec2012)**
17. State the types of inertial separator**. (May/June2013)**
18. Mention any two control equipments for removing fine particulate matter. **(Nov/Dec2007)**
19. What is cyclone separator? **(Nov/Dec2012)**
20. List the factors influencing the choice of air pollution control equipment. **(May/June2013)**
21. What are wet collection devices?
22. State the main objectives of controlling the air pollution.
23. Name some of adsorption units.
24. What are the merits and demerits of ESP?
25. Define scavenging.

## PART-B (16MARKS)

1. With neat sketch explain the working principle of electrostatic precipitator. (**May/June2016,May/June2012,Nov/Dec2012)**
2. Explain how gaseous pollutants are controlled using principle of adsorption and absorption.

**(May/June2016,May/June2013,Nov/Dec2012)**

3. How does a bag house filter work? What are the positives and negatives of filtration process?

**(Nov/Dec2012,May/June2013)**

4. Suggest an air pollution control plan for a cement industry and justify.

**(Nov/Dec2011,Nov/Dec2012)**

5. Explain the process of selection of air pollution control equipment. **(Nov/Dec2015)**
6. Explain the principle of operation and working of a settling chamber. How its efficiency can be improved? **(May/June2013)**

# UNIT – IV

# CONTROL OF GASEOUS CONTAMINANTS

## PART-A (2MARKS)

1. Define the term air quality index. **(May/June2012,Nov/Dec2011)**
2. Brief about air act. **(May/June2012)**
3. Define air pollution index **(Nov/Dec2012)**
4. What is zoning of a city? **(Nov/Dec2012)**
5. What is zoning in air pollution control measures? **(Nov/Dec2011)**
6. What are air quality Standards? **(May/June2013)**
7. State the purpose of air quality monitoring. **(May/June2013)**
8. What are the emission standards? **(May/June2012)**
9. Define EIA. **(Nov/Dec2012,May/June2016)**
10. List the air quality standards for residence zone. **(Nov/Dec2015)**
11. List the enforcement authority for preventing air pollution. **(Nov/Dec2015)**
12. Mention the advantages of Environmental Impact Assessment. (**Nov/Dec2015)**
13. Write the purpose of air quality index. **(May/June2016)**
14. What are the types of industrial zone? **(May/June2016)**
15. Define ambient air quality**. (May/June2014)**
16. State the objectives of ambient air quality standards. **(May/June2012)**
17. What is soiling index?
18. State the objectives of air zoning.
19. Define EIA report.
20. What is an environmental impact?
21. List out the factors considered in the ambient air quality monitoring.
22. What are the air pollution factors to be considered while locating a new industry?
23. State the types of EIA.
24. What are the different methods of zoning?
25. What are emission measurements?

## PART-B (16MARKS)

1. Describe the step by step procedure of Environmental Impact Assessment. (**Nov/Dec2015,May/June2013,Nov/Dec2012)**
2. Explain how the air quality monitoring is carried out. **(May/June2013,May/June2012)**
3. What are the preventive measures for air pollution? How do 'Town Planning' bring air pollution control? Explain. **(May/June2013,May/June2012,May/June2016)**
4. State and explain the goals of air quality standards. **(May/June2012,Nov/Dec2012)**
5. Discuss environmental legislation regarding air pollution control.

**(Nov/Dec2015,May/June2012,May/June2016)**

6. Explain the advantages of Environmental Impact Assessment. **(Nov/Dec2015)**

# INDOOR AIR QUALITY MANAGEMENT

## PART-A (2MARKS)

1. What is noise? **(May/June2012)**
2. Define sound pressure level**? (May/June2012,Nov/Dec2012)**
3. Define $L_N$ and $L_{equ}$**. (Nov/Dec2012**)
4. What is threshold shift? **(Nov/Dec2012,May/June2012)**
5. How is a noise characterized? **(Nov/Dec2011)**
6. What are the strategies of noise control? **(Nov/Dec2011)**
7. What are the various noise sources? **(May/June2013,May/June2016)**
8. State the noise standards**. (May/June2013)**
9. Define noise pollution. (**Nov/Dec2015)**
10. What is noise indicator? **(May/June2016)**
11. Write the effects of noise pollution. **(May/June2016)**
12. What are the preventive methods of noise pollution? **(Nov/Dec2015)**
13. Define wave number. **(May/June2012)**
14. What is noise rating system? **(Nov/Dec2011)**
15. Enumerate the causes for noise pollution**. (May/June2016)**
16. State ultrasound. **(May/June2012)**
17. Write a short note on noise criteria. **(May/June2012)**
18. How sounds are classified? **(Nov/Dec2007)**
19. List out the classification of noise pollution**. (May/June2014)**
20. What are the factors influencing the method of selection of noise control in transmission path? **(Nov/Dec2011)**
21. Define noise assessment.
22. What are the objectives of noise measurement?
23. What is meant by SAC?
24. Define NRC.
25. What are the factors influencing the intensity of traffic noise?

## PART-B (16MARKS)

1. Explain the effects and assessment of Noise Pollution and list the standards. **(Nov/Dec2015,May/June2016)**
2. Make a detailed discussion on effects of Noise Pollution. **(Nov/Dec2012,May/June2013,May/June2016)**
3. Explain the different noise control methods. **(Nov//Dec2012,May/June2013,Nov/dec2015)**
4. What is noise rating system? What is its importance? (**May/June2012,Nov/Dec2012,Nov/Dec2011)**
5. Describe the sources of Noise Pollution. **(May/June2012,Nov/Dec2015)**
6. Explain the methods to control noise pollution in industrial area. **(May/June2016)**

# OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT - I - INTRODUCTION

## PART - A

**1. Define Air pollution ?**

Air pollution is the excessive concentration of foreign matters in the air which adversely affects the human beings of the individual or causes damage to the property (Or) Any substance in the air that causes damages to health and properties. (Or) The presence in ambient atmosphere of substances, generally resulting from the activity of man, in sufficient concentration, present for a sufficient time and under circumstances to interfere significantly with comport, health or welfare of persons or with full use or enjoyment of property.

**2. What are natural contaminants?**

Natural fog, pollen grains, bacteria and product of volcanic eruption.

**3. How inhalation of carbon monoxide affects human health?**

It reduces the ability of the hemoglobin to carry oxygen to the body tissues. Neurological disasters take place.

**4.What is Fog?**

Visible aerosols in which the dispersed phase in liquid.

**5.Correlations between weather variables and ozone concentrations ?**

Better correlation in summer and at inland stations. Most important variables for ozone prediction: 850-mb (about 5,000 feet high) temperature. 950-mb temperature, inversion base height, inversion magnitude, and maximum mixing height also show significant correlations with ozone concentration.

**6. Briefly explain the formation of Ozone?**

Photochemical (summer smog) forms when pollutants such as nitrogen oxides and organic compounds react together in the presence of sunlight. A gas called ozone is formed Nitrogen Dioxide + Sunlight + Hydrocarbons.

**7. Ozone ?**

This is a very general representation of the formation of ozone in the lower atmosphere. In actual fact, many different chemical reactions produce Ozone.

**8. List out any four sources of Air Pollution?**

Combustion process, Chemical processes, Petroleum operations and Metallurgical processes.

**9. What is Smog? Give the types ?**

Smog is a synchronism of two wards- smoke and fog. Smoke can be of two types photochemical or coal induced.

**10. Briefly Explain Particulate matters ?**

Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

**11. Effect of Pollution Damage to Plants ?**

With the destruction and burning of the rain forests more and more CO2 is being released into the atmosphere. Trees play an important role in producing oxygen from carbon dioxide. "A 115 year old Beech tree exposes about 200,000 leaves with a total surface to 1200 square meters. During the course of one sunny day such a tree inhales 9,400 liters of carbon dioxide to produce 12 kilograms of carbohydrate, thus liberating 9,400 liters of oxygen. Through this mechanism about 45,000 liters of air are regenerated which is sufficient for the respiration of 2 to 3 people". This process is called photosynthesis which all plants go through but some yield more and some less oxygen. As long as no more wood is burnt than is reproduced by the forests, no change in atmospheric CO2 concentration will result.

**12. How to Reduce the Pollution ?**

You can help to reduce global air pollution and climate change by driving a car that gets at least 35 miles a gallon, walking, bicycling, and using mass transit when possible. Replace incandescent light bulbs with compact fluorescent bulbs, make your home more energy efficient, and buy only energy efficient appliances. Recycle newspapers, aluminum, and other materials. Plant trees and avoid purchasing products such as Styrofoam that contain CFCs. Support much stricter clean air laws and enforcement of international treaties to reduce ozone depletion and slow global warming

**13. What are the effects of photo chemical smog?**

Eye irritation, Vegetation Damage, Visibility Reduction, Cracking of Rubbers

**14. Classification of sampling Methods ?**

Insitu sampling and remote sensing

**15. Define Acid rain ?**

Acid rain (or acid deposition, as it's called in technical circles) is produced by the burning of fossil fuels. It is formed when emissions of sulfur dioxide and nitrogen oxides react in the atmosphere with water, oxygen and oxidants to form various acidic compounds. These compounds then fall to the ground in either wet or dry form. Refer to all precipitation-rain, snow, and dew which is more acidic than normal.

**16. Define Photo chemical reaction ?**

Any chemical reaction that is initiated as a result of absorption of light.

**17. List out the Air pollution emission source ?**

Point source, Line sources, Area source, Volume source

**18. Definition of the Term “Portable” ?**

The word portable typically conveys an object that is “Carried or moved with ease, such as a light or small box

**19. Definition of the Term “Mobile” ?**

The definition of mobile is essentially “…capable of moving or of being moved readily from place to place: a mobile organism; a mobile missile system.”

**20. Briefly explain greenhouse effect ?**

The greenhouse effect is the heating of the surface of a planet or moon due to the presence of an atmosphere containing gases that absorb and emit infrared radiation. Thus, greenhouse gases trap heat within the surface-troposphere system. This mechanism is fundamentally different from that of an actual greenhouse, which works by isolating warm air inside the structure so that heat is not lost by convection. The greenhouse effect was discovered by Joseph Fourier in 1824, first reliably experimented on by John Tyndall in 1858, and first reported quantitatively by Svante Arrhenius.

**21. Explain the term global warming ?**

Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Global surface temperature increased 0.74 ± 0.18 °C (1.33 ± 0.32 °F) during the last century. The Intergovernmental Panel on Climate Change (IPCC) concludes that most of the observed temperature increase since the middle of the 20th century is caused by increasing concentrations of greenhouse gases resulting from human activity such as fossil fuel burning and deforestation

**22. Define aerosols ?**

An aerosol can be defined as a dispersion of solid and liquid particles suspended in gas. Atmospheric aerosols, unsurprisingly, refer to solid and liquid particles suspended in air. Aerosols are produced by dozens of different processes that occur on land and water surfaces, and in the atmosphere itself. Aerosols occur in both the troposphere and the stratosphere, but there are considerable differences in the size ranges, chemical nature and sources of the aerosols that occur in these two atmospheric layers.

**23. Effect on CO ?**

The main and immediate benefits of using reformulated gasoline in the car is the reduction in the CO exhaust emissions levels. The addition of an oxygenate such as MTBE to the gasoline provides extra oxygen to the fuel combustion process and it works in the same way as the oxygen contained in the external combustion air supplied to the engine. As a result, more complete combustion of the hydrocarbons occur and more CO is oxidized to CO2. The net results is a decrease in the concentrations of CO exhaust emissions.

**24. Effect on Ozone Formation ?**

The reformulated gasoline containing MTBE decreases the ozone formation in the atmosphere. The oxygen present in the MTBE added to the gasoline ensures more complete combustion of fuel hydrocarbons and thus UBHC released to the atmosphere are reduced. As stated earlier, a reduction in $NO_x$ level is also achieved using MTBE-gasoline blends. Both hydrocarbons as well as $NO_x$ are precursors of ozone formation. Thus a reduction in the concentrations of precursors decreases the ozone formation in the atmosphere.

**25. What are Effects of Air Pollutants ?**

Air pollution effects may also be divided into several categories, with such effects encompassing those that are health-related as well as those associated with damage to materials or which cause decreases in atmospheric aesthetic features. Examples of effects on human health include eye irritation, headaches and aggravation of respiratory difficulties. Plants and crops have been subjected to undesirable consequences of air pollution, including abnormal growth patterns, leaf discoloration or spotting and death. Property damage include property devaluation because of odors, deterioration of materials such as concrete statutory, discoloration of painted surfaces. The aesthetic effects include reductions in visibility, discoloration of air, photochemical smog- related traffic disruptions at airports and the general nuisance aspects of odors and duct.

**26. Define Pollution ?**

Unfavorable alteration of our surroundings or the process of discharging unwanted matters into environment which causes harmful effects on living beings and damage to materials. The quality of environment (air, water, soil) is affected due to the presence of pollutants. Pollutant is any substance present in the environment which can cause harmful effects to living organisms and materials. Pollutants may be solid, liquid or gas.

**27. Define the Classification of Pollutants ?**

Primary and Secondary Pollutants

**28. What are Primary Pollutants and Define with Examples ?**

The substance emitted directly to environment from an identifiable source is called as primary pollutants. Eg. $SO_2$, $NO_2$, CO.

**29. What are Secondary Pollutants and Define with Examples?**

They are formed from the primary pollutants by chemical interaction between various constituents present in the atmosphere. Eg. $H_2CO_3$, $H_2SO_4$, HCHO, PAN (PeroxyAcyl Nitrate).

**30. Define the Expansion of PAN and define it ?**

PeroxyAcyl Nitrate (PAN).

**31. Describe about Biodegradable Pollutants ?**

Based on the decomposition properties of pollutants they are classified as Biodegradable and Non biodegradable pollutants.

The pollutants which are readily decomposed by natural process or microbial action are called biodegradable pollutants. Eg. Municipal sewage, dead plants and animals.

**32. Define Non Biodegradable pollutants ?**

Based on the decomposition properties of pollutants they are classified as Biodegradable and Non biodegradable pollutants.

The pollutants are not readily decomposed or slowly decomposed by natural process and microbial action. Eg. Mercury, Lead, Aluminum, DDT, Long chain phenolic compounds.

**33. What is mean by Synergism ?**

The phenomenon of increased toxicity by chemical interaction among the pollutants are known as synergism.

**34. Discuss about different kinds of Pollution ?**

Air, Water, Soil, Marine, Noise, Thermal and Nuclear Hazards**.**

**35. Elucidate the Composition of $N_2$, $O_2$ and Argon in the atmospheric air ?**

$N_2$ = 78%, $O_2$ = 21%, Argon = < 1%

**36. What are natural sources of Air Pollution ?**

Natural sources causes large scale of air pollution which is beyond man's control. Eg. Volcanic eruptions, Forest fires, Biological decay, Pollen grains, Marshes, Wind dust blown, Sea salt can cause air pollution.

**37. Define Man made sources of Air pollution ?**

These are also called as Anthropogenic activities. Industries emit $SO_2$, $NO_2$, HF, HCl, $H_2S$, dust, fumes. Automobiles emit hazardous pollutants like CO, $CH_4$, NO, Lead. Advanced agricultural techniques release DDT, BHC, Organic phosphates, Arsenic, Lead.

**38. Explain Organic Pollutants with examples ?**

According to the chemical composition they are classified as Organic pollutants and Inorganic Pollutants.

Eg. Hydrocarbons, aldehydes, ketones and amines.

**39. Explain Inorganic Pollutants with examples ?**

According to the chemical composition they are classified as Organic pollutants and Inorganic Pollutants.

Eg. $NO_x$, $SO_2$, $SO_3$, $H_2S$, HF, HCl.

**40. Define Gaseous Pollutants ?**

Eg. CO, $CO_2$, $NO_x$, $SO_x$

**41. Define Particulate Pollutants ?**

It consists of finely divided solids, liquids, colloids. Eg. smoke, mist, dust. Air pollutants are produced at outdoor and indoor levels.

**42. Elucidate about Outdoor air pollutants ?**

It occurs both in urban and rural areas. This is due to human activities.

**43. Elucidate about Indoor air pollutants ?**

These are the primary air pollutants. Eg. Radon gas is emitted from building materials like bricks, tiles. CO and Benzene from cigerette smoke. Burning fuels in kitchen liberates CO, $SO_2$, HCHO, BAP. (Benzo - (a) pyrene).

## OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT - II - METEOROLOGY

## PART - A

**1. What is adiabatic lapse rate ?**

The decrease of atmosphere temperature with height.

**2. List out any four sampling methods ?**

Sedimentation, filtration, Impingement, ESP.

**3.National Ambient Air Quality Standard for ozone (NAAQS) ?**

Primary standard to protect public health. One-hour average ozone > 0.12 ppm for federal standard. One-hour average ozone > 0.09 ppm for state standard.

**4. Define Ambient air quality ?**

A physical and chemical measure of the concentration of contaminants in the ambient atmosphere. The quality is usually monitored over a specific period.

**5. What is the word MINAS stands for ?**

Minimum National Air Quality Standards.

**6. What is Mixing Height ?**

Height above the earth's surface to which related pollutants will extend, primarily through the action of atmospheric turbulence.

**7. Define Fumigation ?**

The phenomenon in which pollutants that are aloft in the air are brought rapidly to ground level when the air destabilizes.

**8. Define Dispersion ?**

The mixing of gases contain the high concentration of pollutant.

**9. Write short note on Air monitoring ?**

The process of detention and measurement of pollutants in air.

**10. Define Mass concentration ?**

Concentration expressed in terms of mass of a substance per unit volume of gas or liquid.

**11. What do you meant by Pressure drop ?**

The differential pressure b/w two points in a system. The resistance to flow b/w in the two points.

**12. Relative humidity ?**

The ratio of the actual vapors pressure of the air to the saturation vapor pressure.

**13. What is Inversion ?**

Condition in the atmosphere in which air temperature increases with elevation, under this conditions, the atmosphere is said to be in stable equilibrium.

**14. Briefly explain Box model dispersion ?**

The box model is the simplest of the model types It assumes the air shed (i.e., a given volume of atmospheric air in a geographical region) is in the shape of a box. It also assumes that the air pollutants inside the box are homogeneously distributed and uses that assumption to estimate the average pollutant concentrations anywhere within the airshed. Although useful, this model is very limited in its ability to accurately predict dispersion of air pollutants over an air shed because the assumption of homogeneous pollutant distribution is much too simple.

**15. Briefly explain Gaussian model ?**

The Gaussian model is perhaps the oldest (circa 1936) and perhaps the most commonly used model type. It assumes that the air pollutant dispersion has a Gaussian distribution, meaning that the pollutant distribution has a normal probability distribution. Gaussian models are most often used for predicting the dispersion of continuous, buoyant air pollution plumes originating from ground-level or elevated sources. Gaussian models may also be used for predicting the dispersion of non-continuous air pollution plumes (called puff models). The primary algorithm used in Gaussian modeling is the Generalized Dispersion Equation for a Continuous Point-Source Plume.

**16. Explain Lagrangian dispersion model ?**

A Lagrangian dispersion model mathematically follows pollution plume parcels (also called particles) as the parcels move in the atmosphere and they model the motion of the parcels as a random walk process. The Lagrangian model then calculates the air pollution dispersion by computing the statistics of the trajectories of a large number of the pollution plume parcels. A Lagrangian model uses a moving frame of reference] as the parcels move from their initial location. It is said that an observer of a Lagrangian model follows along with the plume.

**17. Briefly explain Eulerian dispersion model ?**

Eulerian dispersions model is similar to a Lagrangian model in that it also tracks the movement of a large number of pollution plume parcels as they move from their initial location. The most important difference between the two models is that the Eulerian model uses a fixed three-dimensional Cartesian grid as a frame of reference rather than a moving frame of reference

**18. Briefly explain Dense gas dispersion model ?**

Dense gas models are models that simulate the dispersion of dense gas pollution plumes (i.e., pollution plumes that are heavier than air). The three most commonly used dense gas models are: The DEGADIS model The SLAB model The HEGADAS model

**19. What is Lofting ?**

A type of plume which occurs when an inversion exits only below the plume and the plume is inhibited from mixing downward.

**20. What is Looping ?**

A type of plume which has a wavy character. It occurs in a highly unstable atmosphere because of rapid mixing.

**21.What is Chimney ?**

A structure with an opening or outlet from or through which any air pollutant may be emitted.

**22. Define Coning ?**

A type of plume which is like a cone. This take place in a near neutral atmosphere when the wind velocity is greater than 32km/h.

**23. What is Plume ?**

The path and extent in the atmosphere of the gaseous effluent released from the source, usually a stack

**24. Briefly explain Chimney effect ?**

The vertical penetration of smog through the inversion layer on the south slope of the San Gabriel and San Bernardino Mountains caused by the strong solar heating in the afternoon.

**25. Define Fall out ?**

A radioactive pollutant in the air caused after the explosion of a nuclear device, its degree of contamination depending on several factors, such as distance, wind, and power of the device.

**26. Explain Meteorological factors ?**

i) Air movements influence the fate of air pollutants. so, any study of air pollution should include a study of a local weather patterns (Meteorology).

ii) If the air is calm and pollutants cannot disperse, then the concentration of these pollutants will build up. on the other hand, when strong, turbulent winds blow, pollutants disperse quickly, resulting in lower pollutant concentrations.

**27. How Meteorological data helps ?**

i) Identify the source of pollutants

ii) Predict air pollution events such as inversions and high pollutant concentration days.

iii) Simulate and predict air quality using computer models.

**28. When studying air quality what are the factors to measure ?**

When studying air quality, it is important to measure the following factors as they can help us understand the chemical reactions that occur in the atmosphere. Wind speed and Direction, Temperature, Humidity, Rainfall, Solar Radiation.

**29. Elucidate wind speed and direction ?**

When high pollutant concentrations occur at a monitoring station, wind data records can determine the general direction and area of the emissions. Identifying the sources means planning to reduce the impacts on air quality can takes place. An instrument called anemometer measures wind speed and at out monitoring stations, the type of anemometer we use is a sonic anemometer.

**30. How temperature is measured ?**

Measuring temperature supports air quality assessment, air quality modelling and forecasting activities. Temperature and sunlight (Solar Radiation) play an important role in the chemical reactions that occur in the atmosphere to form photochemical smog from other pollutants. Favorable conditions can lead to increased concentrations of smog. the most common way of measuring temperature is to use a material with a resistance that changes with temperature such as platinum wire. A sensor measures this change and converts it into a temperature reading.

**31. Describe the measurement of Humidity ?**

Water vapour content of air is reported as a percentage of the saturation vapour pressure of water at a given temperature. This is the relative humidity. Measuring humidity uses the absorption properties of a polymer film. the film either absorbs or loses water vapour as the relative humidity of the ambient air changes. A sensor measures these changes and converts them into a humidity reading.

**32. Elaborate the Rainfall measurements ?**

Rain has a scavenging effect when it washes particulate matter out of the atmosphere and dissolves gaseous pollutants. Removing particles improves visibility where there is frequent high rainfall, air quantity is generally better. A common method to measure rainfall is to use a Tipping Bucket Rain gauge. The instrument calculates the quantity and intensity of rainfall using with the area of the funnel and the number and the rate of bucket movements.

**33. What is atmospheric stability and explain with lapse rate and its stability ?**

The ability of atmosphere to enhance or to resist atmospheric motions. A simple way to determine the atmospheric stability is to use dry adiabatic lapse rate and Environmental lapse rate.

ELR > DALR = Sub adiabatic condition, atmosphere is stable.

ELR > > DALR = inversions conditions. very stable atmosphere.

ELR = DALR = Atmosphere is neutral

ELR < DALR = Super adiabatic condition, atmosphere is unstable.

**34. Note the conditions for temperature or thermal inversions with examples ?**

Under certain meteorological conditions the air is very stable and a layer of cooler, dense air lies near the ground with a layer of warmer air above. This condition is called as temperature or thermal inversion and it prevents emissions from dispersing and pollutants build up under the inversion. It clearly shows a thermal inversion where the sides of the valley contain the cool air near the ground.

**35. Explain the important characteristics in atmospheric stability ?**

i) Affects dispersion of pollutants

ii) Temperature elevation relationship principal determinant of atmospheric stability

iii) Stable - little vertical mixing and pollutants emitted near surface tend to stay there.

iv) Environmental Lapse Rate (ELR) is same as Dry Adiabatic Lapse Rate (DALR)

v) Shapes of plumes depends upon atmospheric stability conditions.**?**

**36. What are the general characteristics of stack plumes ?**

i) Dispersion of pollutants.

ii) Wind - carries pollution downstream from source.

iii) Atmospheric turbulence - causes pollutants.

iv) fluctuate from main stream in vertical and crosswind directions.

v) Mechanical and atmospheric heating both present at same time but in varying ratios.

vi) Affect plume dispersion differently.

**37. What are the types of plumes ?**

Plume types are important because they help us understand under what conditions of contaminants at ground level. Looping plume, Coning plume, Fanning plume, Lofting plume, Fumigation.

**38. Note about fanning plume ?**

i) It occurs under large nagative lapse rate

ii) Strong inversion at a considerable distance above the stack

iii) Extremely stable atmosphere

iv) Little turbulence

v) If plume density is similar to air, travels downwind at approximately same elevation.

**39. Elucidate the factors that affects diffusion of pollutants ?**

i) Diffusion of pollutants occur due to turbulence, which further depends upon many factors.

ii) Ambient temperature, Temperature of emissions, Roughness factors, Wind velocity, Wind direction, Humidity and Stability.

## OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT - III - CONTROL OF PARTICULATE CONTAMINANTS

## PART - A

**1. Explain the principle behind settling chambers ?**

Particles in the air or gas stream settle due to gravity.

**2. Write down the various types of Inertial Separation ?**

Baffle type, Louvre type, Dust trap.

**3. Name the common method of filter cleaning ?**

Rapping, Shaking, Reverse air low, Pulse jet.

**4. State the Principle of cyclone filter ?**

Control of gas borne pollution, particulates using centrifugal and inertial methods.

**5. What is adsorption?**

Removal of impurities from a gas stream by concentration on the surface of solid or liquid.

**6. What are the Advantages of ESP ?**

i) High collection efficiency.

ii) Particle as small as 0.1 mm can be removed.

iii) Low maintained and operating cost.

iv) Low-pressure drop (0.25 – 1.25 cm of water.

v) Treatment time is negligible (0.1 – 10. s).

**7. What are the Disadvantages of Esp ?**

i) High initial cost.

ii) Space requirement is more.

iii) Possible explosion hazards during collection of combustible gases or particles.

iv) Poisonous gas , ozone , is produced by the negatively charged electrodes during gas ionization.

**8. Briefly explain Bag filter ?**

The most common type of collector is tubular type, consisting of tubular bags. A bag house or bag filter consists of numerous vertical bags. They are suspended with open ends attached to a manifolds

**9. List out the type of Scrubbers ?**

Spray towers, Venturi scrubbers, Cyclone scrubbers, Packed scrubbers, Mechanical scrubbers

**10. Define Impinger ?**

A sampling instrument adopting the principle of impingement for the collection of particulate matters.

**11. What is Bag house ?**

An air pollution control device that traps gas borne particulate by forcing the gas through filter bags

**12. Define the term Contaminant ?**

Unwanted material usually harmful or of a nuisance value or both

**13. Define Cyclone filter ?**

A type of particulate collector which depends upon centrifugal force for its action.

**14. What is meant by Dry bulb temperature ?**

The actual temperature of the gas. Measured with a conventional thermometer.

**15. Define Fumigation ?**

The phenomenon in which pollutants that are aloft in the air are brought rapidly to GL when the air destabilizes.

**16. What is Incineration ?**

Combustion of solid, liquid, or gases wastes under controlled condition.

**17. What is meant by Inertial separators ?**

Air pollution control equipment that utilizes the principles of inertial to remove particulate matter from a stream of air or gas.

**18. What Is the Chemical Composition of Air ?**

Atmosphere is made up of only five gases: nitrogen, oxygen, water vapor, argon, and carbon dioxide. Several other compounds also are present. Although this CRC table does not list water vapor, air can contain as much as 5% water vapor, more commonly ranging from 1- 3%. The 1- 5% range places water vapor as the third most common gas.

**19. What is a wind rose ?**

A wind rose is a circular display of how wind speed and direction are distributed at a given location for a certain time period. [or] Windrose plots are usually used to display values which are related to compass directions. For example it could be used to illustrate measured wind strengths over a time period in different directions. An basic Windrose plot Illustrates a basic example of a windrose graph with one windrose plot.

**20. What causes condensation ?**

Condensation is the formation of liquid drops of water from water vapor. It is the process which creates clouds, and so is necessary for rain and snow formation as well. Condensation in the atmosphere usually occurs as a parcel of rising air expands and cools to the point where some of the water vapor molecules clump together faster than they are torn apart from their thermal energy.

**21. Combustion Definition ?**

Combustion is a chemical reaction chemical that occurs between a fuel and an oxidizing agent that produces energy, usually in the form of heat and light.

**22. Define Atmospheric Stability and Instability Atmospheric stability ?**

The temperatures normally increase as we get closer to the earth's surface. This is due in part to the greater molecular activity of denser, more compressed air at lower altitudes. These conditions change throughout a 24-hour period, as the daytime solar heating and nighttime heat loss to and through the atmosphere tend to modify the temperature distributions.

**23. Define Stable and Unstable Air ?**

Weather is strongly affected by how stable or unstable the atmosphere is. Stable air means that the weather is likely to be calm. It may rain or snow slowly and steadily, it may be sunny, but the weather will not change quickly. Unstable air means that the weather might change quickly with very little warning. Unstable air leads to sudden thunderstorms. What makes the atmosphere stable or unstable? Picture an invisible box of air called an air parcel. If we compare the temperature of this air parcel to the temperature of air surrounding it, we can tell if it is stable (likely to remain in place) or unstable (likely to move).

**24. Briefly explain the Control equipment in air pollution ?**

Any apparatus, devices, equipment or system to control the quality and manner of emission of any air pollution and includes any devices used for securing the efficient operation of any industrial plant.

**25. Define Due point ?**

For air containing water vapor, it is the temperature at which liquid water begins to condense for a given state of humidity and pressure, as the temperature is reduced.

**26. What is Dust fall ?**

The weight of particulate matter deposited due to gravitational action per unit time per unit area of the surface.

**27. Explain about Electrostatic Precipitators ?**

An electrostatic precipitator (ESP) is a particle control device that uses electrical forces to move the particles out of the flowing gas stream and onto collector plates.

**28. Discuss the principle of Electrostatic precipitator ?**

The ESP places electrical charges on the particles causing them to be attracted to oppositely charged metal plates located in the precipitator. the particles are removed from the plates by rapping and collected in a hopper located below the unit. the removal efficiencies for ESPs are highly variable, however, for very small particles alone, the removal efficiency is about 99%.

**29. What are fabric filters and its principle ?**

It removes dust from a gas stream by passing the stream through a porous fabric and is efficient at removing fine particles and can exceed efficiencies of 99% in most applications.

**30. what are the characteristics of fiber materials ?**

The selection of the fiber material and fabric construction is important to bag house performance. The fiber material from which the fabric is made must have adequate strength characteristics at the maximum gas temperature expected and adequate chemical compatibility with both the gas and the collected dust.

**31. Explain venturi scrubbers and its principle ?**

Venturi scrubbers use a liquid stream to remove solid particles. In this gas laden with particulate matter passes through a short tube with flared ends and a constricted middle. This constriction causes the gas stream to speed up when the pressure is increased. These are effective in removing small particles with removal efficiencies of up to 99%.

**32. Discuss the principle involved in gravity separators ?**

It separates products of same size but with difference in specific weight. It has a vibrating rectangular deck, which makes it easy for the product to travel a longer distance, ensuring improved quality of the end product.

**33. Explain the concepts involved in gravity separation ?**

It is a method of separating two components either a suspension or dry granular mixture when separating the components with gravity is sufficiently practical. the components of the mixture have different specific weight. All the gravitational methods are common in the sense that they all use gravity as (separator) the dominant force.

**34. Describe about the methods used other than gravity separation and why ?**

Other methods like flocculation, Coagulation and suction are often used methods. Because these methods are applied to make the separation faster and more efficient.

**35. What are the advantages of gravitational methods ?**

The main advantage of gravitational methods are their cost effectiveness and excellent reduction.

**36. Discuss about centrifugal separators ?**

These high efficiency cyclones are frequently used as product receivers as pre cleaners to high efficiency fabric type dust collectors or as independent collectors for coarse dusts.

**37. What are the advantages of centrifugal separators ?**

i) Stable pressure drop for a given gas flow.

ii) Constant efficiency for a given particulate condition.

iii) No moving parts , no replaceable filters.

iv) Ability to handle extremely high dust concentration.

v) High temperature capability**.**

**38. Explain Efficiency ?**

Efficiency is a function of the physical parameters of the applications and the design parameters of the cyclone. Cyclone efficiency increases with coarse particle size distribution, Higher product specific gravity, Lower gas density.

**39. Define the principle of centrifugal separators ?**

A centrifugal separator is a separation device that uses the principle of inertia to remove particulate matter from flue gases. In this separators, dirty flue gas enters a chamber containing a vortex, similar to a tornado. Because of the difference in inertia of gas particles and larger particulate matter, the gas particles move up the cylinder while larger particles hit the inside wall and drop down. Thus separates the particulate matter from the flue gas and leaving cleaned flue gas.

**40. Elucidate the term Recycling ?**

Gravity separators are used to remove viable or valuable components from the recycling mixture i.e. metal from plastic, rubber from plastic, different grades of plastic and these valuable materials are further recycled and reutilized.

**41. What are the type of gravity separators ?**

Conventional Jigs, Pinched Sluices, Spirals, Centrifugal Jigs, Shaking Tables.

## OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT - IV - CONTROL OF GASEOUS CONTAMINANTS

## PART - A

1. **How do any calculate the efficiency of the separating Device ?**

ή= {Quantity of particulates collected from the gas / Quantity present in the gas}

**2. What do you mean by Emission standards ?**

Level for specific group of emitter and require that all member of these groups emit no more than these permitted emission level

**3. Define Particle Re-entrainment ?**

It is associated with particle charging, It is occurs due to inadequate precipitator area ,or inadequate dust removal from hopper

**4. Air pollution index ?**

An arbitrarily derived mathematical combination of air pollutions witch give a single number trying to describe the ambient air quality.

**5. Define Pollution Standard Index (PSI) ?**

A numerical scale of 0-500 corresponding to various pollution concentrations

**6. Define Air quality criteria ?**

Scientific information about the levels of air pollution and the durations of exposure which result in adverse effects on health and welfare

**7. Air Quality Index (AQI implemented since July 23, 1999 by EPA) ?**

AQI is calculated for the 6 criteria pollutants according to the EPA formulas. The highest AQI value is adopted as the daily AQI. Foe example, if the AQI for ozone is 90 and 88 for SO2.The reported AQI is 90.

**8. Define Pollution Potential ?**

Holzworth's definition:

C/Q = L/UH

C: pollution concentration.

Q: emission rate.

L: city size along wind dimension (10 km or 100 km).

U: wind speed.

H: mixing height (height to which an air parcel can rise)

**9. How do you Measure Air Quality ?**

There are many ways to measure air pollution, with both simple chemical and physical methods and with more sophisticated electronic techniques. There are four main methods of measuring air pollution. Passive sampling methods Active sampling methods Automatic methods Remote optical / long path-analyzers use spectroscopic techniques, make real-time measurements of the concentrations of a range of pollutants including nitrogen dioxide and sulphur dioxide.

**10. Definition of the Term “Instrumented” ?**

Instrumented means to be “a device for recording, measuring, or controlling, especially such a device functioning as part of a control system.”

**11. Name some NOx control units ?**

Low NOx burners Selective catalytic reduction (SCR) Selective non-catalytic reduction (SNCR), NOx scrubbers the Exhaust gas recirculation and Catalytic converter (also for VOC control)

**12. Effective Methods to Control Air Pollution ?**

Some of the effective methods to Control Air Pollution are as follows: (a) Source Correction Methods (b) Pollution Control equipment (c) Diffusion of pollutant in air (d) Vegetation (e) Zoning.

**13. What is the Air Quality Index for Health ?**

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that tells you what the air quality currently is in your region and whether or not this might affect the health of you or your child. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. The AQIH is calculated every hour. You can see the current readings on the AQIH map.

**14. Is indoor air quality safety concern (IAQ) a health and safety concern ?**

Indoor air quality has become an important health and safety concern. Common issues associated with IAQ include: Improper or inadequately maintained heating and ventilation systems. Contamination by construction materials, glues, fibreglass, particle boards, paints, chemicals, etc. Increase in number of building occupants and time spent indoors.

**15. What are the common causes of IAQ problems ?**

IAQ problems result from interactions between building materials and furnishing, activities within the building, climate, and building occupants. IAQ problems may arise from one or more of the following causes: Indoor environment - inadequate temperature, humidity, lighting, excessive noise Indoor air contaminants - chemicals, dusts, moulds or fungi, bacteria, gases, vapours, odours Insufficient outdoor air intake.

**16. What are indoor air contaminants ?**

Here are examples of common indoor air contaminants and their main sources: Carbon dioxide ($CO_2$), tobacco smoke, perfume, body odours – from building occupants Dust, fibreglass, asbestos, gases, including formaldehyde – from building materials Toxic vapours, volatile organic compounds (VOCs) – from workplace cleansers, solvents, pesticides, disinfectants, glues Gases, vapours, odours – off-gas emissions from furniture, carpets, and paints Dust mites – from carpets, fabric, foam chair cushions Microbial contaminants, fungi, moulds, bacteria, – from damp areas, stagnant water and condensate pans Ozone – from photocopiers, electric motors, electrostatic air cleaners

**17. Define Zoning ?**

Zoning describes the control by authority of the use of land, and of the buildings thereon. Areas of land are divided by appropriate authorities into zones within which various uses are permitted.

**18. What is the necessity for air quality?**

The levels of air quality necessary with an adequate margin of safety, to protect the public health, vegetation and property.

**19. Define frequency and Method of Air Quality Measurements** ?

The present study of air quality measurement in terms air pollution concentration has been obtained by continuous monitoring for a period of eight hours at all directions and at the proposed project site. The annual mean wind direction pattern has been compiled from the long- term data made available from meteorological department. The sampling directions around the project site has been selected so as to reflect the impact of anthropogenic activities such as emissions from transportation, generation of dust with movement of vehicles, emissions from industrial and domestic activities. Considering the facilities and significant impact on air quality we have selected Suspended Particulate Matter (SPM), Sulphur dioxide (SO2), Nitrogen Oxides (Nox) and Carbon monoxide (CO).

## OCE551 - AIR POLLUTION AND CONTROL ENGINEERING

## UNIT - V - INDOOR AIR QUALITY MANAGEMENT

## PART - A

**1. What is noise ?**

In simple terms, noise is unwanted sound. Sound is a form of energy which is emitted by a vibrating body and on reaching the ear causes the sensation of hearing through nerves.

**2. How can noise affect us ?**

Temporary Deafness: This Persists for about 24 hours after exposure to loud noise. Permanent Deafness: Repeated or continuous exposure to noise of around 100 dB results in permanent hearing loss.

**3. How can we control the Noise source ?**

Reducing the noise levels from domestic sectors, Maintenance of automobiles, Control over vibrations, Low voice speaking, Prohibition on usage of loud speakers and Selection of machinery

**4. What is the difference between sound and noise ?**

Noise is unwanted sound. Sound is a form of energy emitted by a vibrating body and on reaching the ear it causes the sensation of hearing through nerves.

**5. What is the purpose of frequency analysis ?**

frequency analysis allow to separate the main components of the signals by dividing the frequency range of interest into smaller frequency bands using a set of filters

**6. List out typical sources of noise pollution ?**

Source Noise level dB(A) Air compressors 95-104 Quiet garden 30 110 KVA diesel generator 95 Ticking clock 30 Lathe Machine 87 Computer rooms 55-60 Milling machine 112 Type institute 60 Oxy-acetylene cutting 96 Printing press 80 Pulveriser 92 Sports car 80-95 Riveting 95 Trains 96 Power operated portable saw 108 Trucks 90-100 Steam turbine (12,500 kW) 91 Car horns 90-105 Pneumatic Chiseling 118 Jet takeoff 120.

**7. What are the impacts of noise ?**

Physiological effects, Loss of hearing, human performance, Nervous system: Annoyance, Sleeplessness, Damage to material.

**8. What are the methods to control noise pollution ?**

Identify the noise sources from each zone, Find out the noise levels of each zone, Compute Ldn values, Identify the likely causes of noise from noise sources, Develop methodologies to solve the problem, Attempt to solve.

**9. What are the noise exposure limits in a workspace environment ?**

Regulations prescribe that, noise level of 90 dB (A) for more than 8 hr continuous exposure is prohibited. Persons who are working under such conditions will be exposed to occupational health hazards.

**10. What are the ambient noise limits ?**

Sounds produced by all vibrating bodies are not audible. The frequency limits of audibility are from 20 Hz to 20,000 Hz. Noise generation is associated with most of our daily activities. A healthy human ear responds to a very wide range of SPL from - the threshold of hearing at zero dB, uncomfortable at 100-120dB and painful at 130-140 Db. Due to the various adverse impacts of noise on humans and environment noise should be controlled.

**11. Write short notes on Decibel, dB and Ldn ?**

DECIBEL is measurement unit of sound, represented by dB. The day night equivalent noise levels of a community can be expressed as -Ldn , dB(A) = 10 x log10 [15/24 (10Ld/10) + 9/24 (10(Ln + 10)/10)] where, Ld = day-equivalent noise levels (from 6AM - 9 PM), dB (A) Ln = night equivalent noise levels (from 9 PM - 6 AM), dB (A) The day hours in respect to assessment of noise levels, is fixed from 6 AM - 9 PM (i.e., 15hrs) and night hours from 9 PM - 6 AM (i.e., 9 hrs). A sound level of 10 dB is added to Ln due to the low ambient sound levels during night for assessing the Ldn values.

**12. Write short notes on Infrasonic and Ultrasonic Infrasonic ?**

The sound of frequency less than 20Hz. Ultrasonic: The sound of frequency more than 20,000 Hz

**13. Equipment used in the measurement of noise levels ?**

Sound level meter Type-0 : Laboratory reference standard Type-1: Lab use and field use in specified controlled environment Type-2: General field use (Commonly used) Type-3: Noise survey Impulse meters For measurement of impulse noise levels e.g. hammer blows, punch press strokes etc. Frequency analyzers For detailed design and engineering purpose using a set of filters. Graphic recorders Attached to sound level meter. Plots the SPL as a function of time on a moving paper chart. Noise dosimeters Used to find out the noise levels in a working environment attached to the worker

**14. What is noise ?**

Noise is defined as unwanted sound. A sound might be unwanted because it is loud, distracting, or annoying.

**15. How is noise measured ?**

Literally speaking, noise can't be measured directly, since there is no instrument for objectively detecting how "unwanted" something is. What can be measured is the sound level, a quantification of a sound's pressure or intensity and related to its loudness. Sound level is measured in decibels (dB), by a device called a sound level meter.

**16. What is a decibel ?**

What are typical decibel levels of some common sounds? A whisper is 30 dB, conversational speech is 60 dB, and someone shouting at you from an arm's length away is 85 dB. Noise levelsof home appliances range from 50 dB (a refrigerator) to 95 dB (a food processor). Lawn equipment and power tools have noise levels of 80–120 dB.

**17. How many decibels can the human ear handle ?**

Immediate and irreversible nerve damage can be caused by sounds at 140 dB or higher (120 dB in young children). However, damage also occurs at lower sound levels, and this harm accumulates over time. Any sound above 85 dB can cause wear and tear on your ears that reduces your hearing acuity over time.

**18. What is the loudest sound possible ?**

Sound is normally carried in air as a pressure wave. When the pressure of a sound wave becomes as high as the air pressure itself, the sound becomes a shock wave. Normal air pressure at sea level is 14.7 pounds per square inch (psi), or 101,325 pascals (Pa), which is equivalent to 194 decibels (dB). So 194 dB is the loudest sound possible in air at sea level; beyond that point it becomes a shock

wave. (Sound waves that are transmitted through water or other substances would have different limits.)

**19. What are the effects of noise on human health ?**

Noise has direct physiological effects such as hearing damage (including hearing loss and tinnitus, or ringing in the ears), as well as cardiovascular and hormonal disturbances. Indirect effects include sleep loss, interference with concentration and learning, mood changes and aggression, and social isolation.

**20. How does noise affect babies and children ?**

Because the ear canal of a young child is smaller than an adult's, sound pressure is up to 20 dB greater than that in an adult ear. In addition to the threat to a child's hearing, noise causes physiological and mental stress, and significantly impacts learning and cognitive development. Background noise also interferes with speech perception and language acquisition.

**21. What is "white noise" ?**

White noise is a sound similar to radio static, or the sound a fan makes, that is often used to mask unpleasant sounds. Some people find it helpful for sleeping, and it can be a soothing sound for babies.

**22. What are the most common sources of noise pollution ?**

Worldwide, the most common sources of noise pollution are cars, trucks, and other motor vehicles. Planes and trains also contribute to noise pollution. Other sources include factory machinery, power tools, and construction equipment.

**23. What problems does noise pollution cause for people ?**

The World Health Organization (WHO) cites seven categories for the ways noise adversely affects human health: Noise-induced hearing impairment Interference with speech communication Sleep disturbances Cardiovascular and physiological effects Mental health effects on performance of tasks Annoyance and effects on behavior.

**24. What problems does noise pollution cause for animals ?**

Wild animals rely on their hearing for detecting predators, finding mates, establishing territory, and recognizing warning alerts. Unnaturally high levels of noise can damage their hearing and can also mask more subtle sounds that they need to hear in order to survive and reproduce. They may also react with a fight-or-flight response to artificial sounds such as aircraft noise, thereby using up valuable energy reserves to flee from a non-existent predator. If noise in an area becomes too intrusive, animals may shift to a new territory or alter their migration patterns, which can create new complications for their mating and survival.

**24. What are the laws regarding noise pollution ?**

Occupational noise is treated as a health and safety issue and is regulated at the state or national level in many countries. Community noise is typically regarded as a nuisance issue rather than a matter of health, and is normally regulated at local levels of government. The regulations and levels of enforcement vary widely across different communities, and worldwide. Noise-generating products such as automobiles and aircraft may be controlled by industry regulations, and building codes may set requirements for reducing sound transmission in new building construction projects.

**25. What can you do personally to reduce my own noise pollution ?**

Mow your lawn at times that are reasonable for your neighborhood, Avoid using high-noise yard tools such as leaf blowers and power hedge trimmers, Keep your motor vehicle's muffler in good condition, Only honk your horn in an emergency, Train your dog not to bark inappropriately, Put your cell phone on "vibrate" mode, and excuse yourself to a private area to conduct a phone conversation, Turn off the TV if no one is watching it, If you want to. enjoy loud music, use headphones.