Note: This paper contains **fifty(50)** objective type questions for **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. Infrared signals can be used for short range communication in a closed area using _____ propagation.

   (a) Ground   (b) Sky   (c) Line of sight   (d) Space

2. A bridge has access to _____ address in the same network.

   (a) Physical   (b) Network   (c) Datalink   (d) Application

3. The minimum frame length for 10 Mbps Ethernet is _____ bytes and maximum is _____ bytes.

   (a) 64 & 128   (b) 128 & 1518   (c) 1518 & 3036   (d) 64 & 1518

4. The bit rate of a signal is 3000 bps. If each signal unit carries 6 bits, the baud rate of the signal is_____.

   (a) 500 baud/sec   (b) 1000 baud/sec   (c) 3000 baud/sec   (d) 18000 baud/sec

5. Match the following :

List – I	List – II
A. Physical layer	i. Allow resources to network access
B. Datalink layer	ii. Move packets from one destination to other
C. Network layer	iii. Process to process message delivery
D. Transport layer	iv. Transmission of bit stream
E. Application	v. Formation of frames

   Codes :

	A	B	C	D	E
(a)	iv	v	ii	iii	i
(b)	v	iv	i	ii	iii
(c)	i	iii	ii	v	iv
(d)	i	ii	iv	iii	v

6. A grammar G is LL(1) if and only if the following conditions hold for two distinct productions A→ α | β

   I. First (α) ∩ First (β) ≠ (a) where a is some terminal symbol of the grammar.

   II. First (α) ∩ First (β) ≠ λ

   III. First (α) ∩ Follow (A) = φ if λ ∈ First (β)

   (a) I and II   (b) I and III   (c) II and III   (d) I, II and III

7. Which of the following suffices to convert an arbitary CFG to an LL(1) grammar ?

   (a) Removing left recursion alone

   (b) Removing the grammar alone

   (c) Removing left recursion and factoring the grammar

   (d) None of the above

8. A shift reduce parser suffers from

   (a) Shift reduce conflict only

   (b) Reduce reduce conflict only

   (c) Both shift reduce conflict and reduce conflict

   (d) Shift handle and reduce handle conflicts

9. The context free grammar for the language $L = \left\{ a^n b^m c^k \mid k = \mid n - m \mid, n \geq 0, m \geq 0, k \geq 0 \right\}$ is

(a) $S \rightarrow S_1 S_3, S_1 \rightarrow aS_1 c \mid S_2 \mid \lambda, S_2 \rightarrow aS_2 b \mid \lambda, S_3 \rightarrow aS_2 b \mid S_4 \mid \lambda, S_4 \rightarrow bS_4 c \mid \lambda$

(b) $S \rightarrow S_1 S_3, S_1 \rightarrow aS_1 S_2 c \mid \lambda, S_2 \rightarrow aS_2 b \mid \lambda, S_3 \rightarrow aS_3 b \mid S_4 \mid \lambda, S_4 \rightarrow bS_4 c \mid \lambda$

(c) $S \rightarrow S_1 \mid S_2, S_1 \rightarrow aS_1 S_2 c \mid \lambda, S_2 \rightarrow aS_2 b \mid \lambda, S_3 \rightarrow aS_3 b \mid S_4 \mid \lambda, S_4 \rightarrow bS_4 c \mid \lambda$

(d) $S \rightarrow S_1 \mid S_3, S_1 \rightarrow aS_1 c \mid S_2 \mid \lambda, S_2 \rightarrow aS_2 b \mid \lambda, S_3 \rightarrow aS_3 b \mid S_4 \mid \lambda, S_4 \rightarrow bS_4 c \mid \lambda$

10. The regular grammar for the language $L = \left\{ n_a(w) \text{ and } n_b(w) \text{ are both even}, w \in \left\{ a, b \right\}* \right\}$ is given by :
(Assume p, q, r and s states)

(a) $p \rightarrow aq \mid br \mid \lambda, q \rightarrow bs \mid ap$

$r \rightarrow as \mid bp, s \rightarrow ar \mid bq$, p and s
are initial and final states.

(b) $p \rightarrow aq \mid br, q \rightarrow bs \mid ap$

$r \rightarrow as \mid bp, s \rightarrow ar \mid bq$, p and s
are initial and final states.

(c) $p \rightarrow aq \mid br \mid \lambda, q \rightarrow bs \mid ap$

$r \rightarrow as \mid bp, s \rightarrow ar \mid bq$
p is both initial and final states.

(d) $p \rightarrow aq \mid br, q \rightarrow bs \mid ap$

$r \rightarrow as \mid bp, s \rightarrow ar \mid bq$
p is both initial and final states.

11. KPA in CMM stands for
(a) Key Process Area   (b) Key Product Area
(c) Key Principal Area   (d) Key Performance Area

12. Which one of the following is not a risk management technique for managing the risk due to unrealistic schedules and budgets ?
(a) Detailed multi source cost and schedule estimation.
(b) Design cost
(c) Incremental development
(d) Information hiding

13. _____ of a system is the structure or structures of the system which comprise software elements, the externally visible properties of these elements and the relationship amongst them.
(a) Software construction   (b) Software evolution
(c) Software architecture   (d) Software reuse

14. In function point analysis, the number of complexity adjustment factors is
(a) 10   (b) 12   (c) 14   (d) 20

15. Regression testing is primarily related to
(a) Functional testing   (b) Development testing
(c) Data flow testing   (d) Maintenance testing

16. How many different truth tables of the compound propositions are there that involve the propositions p and q ?
(a) 2   (b) 4   (c) 8   (d) 16

17. A Boolean function F is called self-dual if and only if

$$F(x_1, x_2, ... x_n) = F(\overline{x}_1, \overline{x}_2, ... \overline{x}_n)$$

How many Boolean functions of degree n are self-dual ?

(a) 2^n (b) $(2)^{2^n}$ (c) $(2)^{n^2}$ (d) $(2)^{2^{n-1}}$

18. Which of the following statement(s) is (are) not correct ?

(i) The 2's complement of 0 is 0.

(ii) In 2's complement, the left most bit cannot be used to express a quantity.

(iii) For an n-bit word (2's complement) which includes the sign bit, there are 2^{n+1} negative integers and one 0 for a total of 2^n unique states.

(iv) In 2's complement the significant information is contained in the 1's of positive numbers and 0's of the negative numbers.

(a) i and iv   (b) i and ii   (c) iii   (d) iv

19. The notation $\exists! xP(x)$ denotes the proposition "there exists a unique x such that $P(x)$ is true".

Give the truth values of the following statements :

I $\exists! xP(x) \to \exists x P(x)$

II $\exists! x \neg P(x) \to \neg \forall x P(x)$

(a) Both I & II are true   (b) Both I & II are false

(c) I – false, II – true   (d) I – true, II – false

20. Give a compound proposition involving propositions p, q and r that is true when exactly two of p, q and r are true and is false otherwise.

(a) $(p \vee q \wedge \neg r) \wedge (p \wedge \neg q \wedge r) \wedge (\neg p \wedge q \wedge r)$

(b) $(p \wedge q \wedge \neg r) \wedge (p \vee q \wedge \neg r) \wedge (\neg p \wedge q \wedge r)$

(c) $(p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \wedge (\neg p \wedge q \wedge r)$

(d) $(p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge r)$

21. Consider the graph given below as :
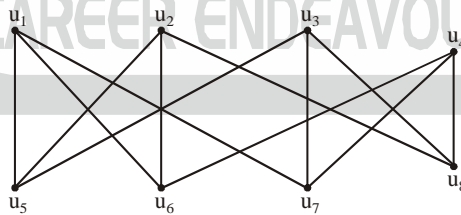
Which one of the following graph is isomorphic to the above graph ?
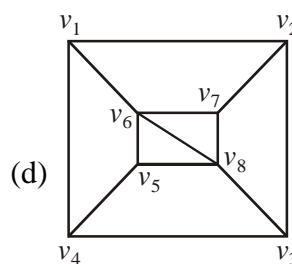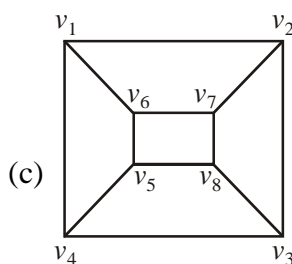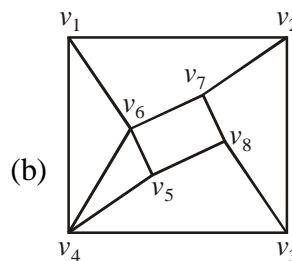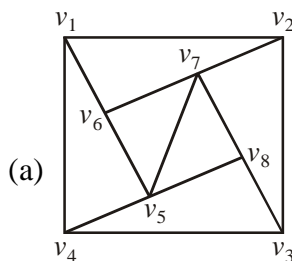
22. The upper bound and lower bound for the number of leaves in a B-tree of degree K with height h is given by :

(a) K^h and $2\left\lceil \dfrac{K}{2} \right\rceil^{h-1}$

(b) $K * h$ and $2\left\lfloor \dfrac{K}{2} \right\rfloor^{h-1}$

(c) K^h and $2\left\lfloor \dfrac{K}{2} \right\rfloor^{h-1}$

(d) $K * h$ and $2\left\lceil \dfrac{K}{2} \right\rceil^{h-1}$

23. Consider a complete bipartite graph $k_{m,n}$. For which values of m and n does this, complete graph have a Hamiltonian circuit

(a) m = 3, n = 2   (b) m = 2, n = 3   (c) $m = n \geq 2$ (d) $m = n \geq 3$

24. Big-O estimates for the factorial function and the logarithm of the factorial function i.e. n! and log n! is given by

(a) O(n!) and O(n log n)

(b) $O(n^n)$ and O(n log n)

(c) O(n!) and O(log n!)

(d) $O(n^n)$ and O(log n!)

25. How many cards must be chosen from a deck to guarantee that atleast
    (i) two aces of two kinds are chosen.
    (ii) two aces are chosen.
    (iii) two cards of the same kind are chosen.
    (iv) two cards of two different kinds are chosen.

(a) 50, 50, 14, 5   (b) 51, 51, 15, 7   (c) 52, 52, 14, 5   (d) 51, 51, 14, 5

26. Match the following with respect to the mobile computing technologies :

List – I	List – II
A. GPRS	i. An integrated digital radio standard
B. GSM	ii. 3G wireless/ Mobile technology
C. UMTS	iii. Nine different schemes for modulation and error correction
D. EDGE	iv. An emerging wireless service that offers a mobile data

Codes :

	A	B	C	D
(a)	iii	iv	ii	i
(b)	iv	i	ii	iii
(c)	ii	iii	iv	i
(d)	ii	i	iv	iii

27. Object Request Broker (ORB) is
    I A software program that runs on the client as well as on the application server.
    II A software program that runs on the client side only.
    III A software program that runs on the application server, where most of the components reside.

(a) I, II and III   (b) I and II   (c) II and III   (d) I only

28. A software agent is defined as
    I A software developed for accomplishing a given task.
    II A computer program which is capable of acting on behalf of the user in order to accomplish a given computational task.
    III An open source software for accomplishing a given task.

(a) I   (b) II   (c) III   (d) All of the above

29. Match the following :

List – I	List – II
A. Classification	i. Principal component analysis
B. Clustering	ii. Branch and Bound
C. Feature Extraction	iii. K-nearest neighbour
D. Feature Selection	iv. K-means

Codes :

	A	B	C	D
(a)	iii	iv	ii	i
(b)	iv	iii	i	ii
(c)	iii	iv	i	ii
(d)	iv	iii	ii	i

30. SET, an open encryption and security specification model that is designed for protecting credit card transaction on the internet, stands for
   (a) Secure Electronics Transaction   (b) Secular Enterprise for Transmission
   (c) Security Electronic Transmission   (d) Secured Electronic Termination

31. In a paged memory management algorithm, the hit ratio is 70%. If it takes 30 nanoseconds to search Translation Look-aside Buffer (TLB) and 100 nanoseconds (ns) to access memory, the effective memory access time is
   (a) 91 ns   (b) 69 ns   (c) 200 ns   (d) 160 ns

32. Match the following :

List – I	List – II
A. Multilevel feedback queue	i. Time-slicing
B. FCFS	ii. Criteria to move processes between queues
C. Shortest process next	iii. Batch processing
D. Round robin scheduling	iv. Exponential smoothening

Codes :

	A	B	C	D
(a)	i	iii	ii	iv
(b)	iv	iii	ii	i
(c)	iii	i	iv	i
(d)	ii	iii	iv	i

33. Consider a system with five processes P_0 through P_4 and three resource types R_1, R_2 and R_3. Resource type R_1 has 10 instances, R_2 has 5 instances and R_3 has 7 instances. Suppose that at time T_0, the following snapshot of the system has been taken :

Allocation

	R_1	R_2	R_3
P_0	0	1	0
P_1	2	0	0
P_2	3	0	2
P_3	2	1	1
P_4	0	2	2

Max

R_1	R_2	R_3
7	5	3
3	2	2
9	0	2
2	2	2
4	3	3

Available

R_1	R_2	R_3
3	3	2

Assume that now the process P_1 requests one additional instance of type R_1 and two instances of resource type R_3. The state resulting after this allocation will be
(a) Ready state   (b) Safe state   (c) Blocked state   (d) Unsafe state

34. Match the following :

	List – I		List – II
A.	Contiguous allocation	i.	This scheme supports very large file sizes.
B.	Linked allocation	ii.	This allocation technique supports only sequential files.
C.	Indexed allocation	iii.	Number of disks required to access file is minimal.
D.	Multi-level indexed	iv.	This technique suffers from maximum wastage of space in storing pointers

Codes :

	A	B	C	D
(a)	iii	iv	ii	i
(b)	iii	ii	iv	i
(c)	i	ii	iv	iii
(d)	i	iv	ii	iii

35. Which of the following commands will output "one two three" ?
(a) for val; do echo-n $val; done < one two three
(b) for one two three; do echo-n-; done
(c) for n in one two three; do echo-n $n; done
(d) for n in one two three {echo-n $ n}

36. Mergesort makes two recursive calls. Which statement is true after these two recursive calls finish, but before the merge step ?
(a) The array elements form a heap.
(b) Elements in each half of the array are sorted amongst themselves.
(c) Elements in the first half of the array are less than or equal to elements in second half of the array.
(d) All of the above

37. A text is made up of the characters α, β, γ, δ and σ with the probability 0.12, 0.40, 0.15, 0.08 and 0.25 respectively. The optimal coding technique will have the average length of
(a) 1.7   (b) 2.15   (c) 3.4   (d) 3.8

38. Searching for an element in the hash table requires O(1) time for the _____ time, whereas for direct addressing it holds for the _____ time.
(a) worst-case, average   (b) worst-case, worst-case
(c) average, worst-case   (d) best, average

39. An algorithm is made up of 2 modulus M_1 and M_2. If time complexity of modulus M_1 and M_2 are h(n) and g(n) respectively, the time complexity of the algorithm is
(a) min (h(n), g(n))   (b) max (h(n), g(n))   (c) h(n) + g(n)   (d) h(n) $*$ g(n)

40. What is the maximum number of parenthesis that will appear on the stack at any one time for parenthesis expression given by
(( ) (( )) (( )))
(a) 2   (b) 3   (c) 4   (d) 5

41. Match the following :

	List – I		List – II
A.	Automatic storage class	i.	Scope of the variable is global.
B.	Register storage class	ii.	Value of the variable persists between different function calls.
C.	Static storage class	iii.	Value stored in memory and local to the block in which the variable is defined.
D.	External storage class	iv.	Value stored in CPU registers.

Codes :

	A	B	C	D
(a)	iii	iv	i	ii
(b)	iii	iv	ii	i
(c)	iv	iii	ii	i
(d)	iv	iii	i	ii

42. When we pass an array as an argument to a function, what actually gets passed ?
    (a) Address of the array   (b) Values of the elements of the array
    (c) Base address of the array   (d) Number of elements of the array

43. While (87) printf("computer");
    The above C statement will
    (a) print "computer" 87 times   (b) print "computer" 0 times
    (c) print "computer" 1 times   (d) print "computer" infinite times

44. A friend function can be used to
    (a) avoid argument between classes.
    (b) allow access to classes whose source code is unavailable.
    (c) allow one class to access an unrelated class.
    (d) None of the above

45. Which of the following is the correct value returned to the operating system upon the successful completion of a program ?
    (a) 0   (b) 1   (c) – 1   (d) Program do not return a value.

46. Manager's salary details are hidden from the employee. This is called as
    (a) Conceptual level data hiding   (b) Physical level data hiding
    (c) External level data hiding   (d) Local level data hiding

47. Which of the following statements is false ?
    (a) Any relation with two attributes is in BCNF.
    (b) A relation in which every key has only one attributes is in 2NF.
    (c) A prime attribute can be transitively dependent on a key in 3NF relation.
    (d) A prime attribute can be transitively dependent on a key in BCNF relation.

48. A clustering index is created when_____.
    (a) primary key is declared and ordered   (b) no key ordered
    (c) foreign key ordered   (d) there is no key and no order

49. Let R = {A, B, C, D, E, F} be a relation schema with the following dependencies
    $C \rightarrow F, E \rightarrow A, EC \rightarrow D, A \rightarrow B$
    Which of the following is a key for R ?
    (a) CD   (b) EC   (c) AE   (d) AC

50. Match the following :

List – I	List – II
A. DDL	i. LOCK TABLE
B. DML	ii. COMMIT
C. TCL	iii. Natural Difference
D. BINARY Operation	iv. REVOKE

Codes :

	A	B	C	D
(a)	ii	i	iii	iv
(b)	i	ii	iv	iii
(c)	iii	ii	i	iv
(d)	iv	i	ii	iii

Note: This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. Beam-penetration and shadow-mask are the two basic techniques for producing color displays with a CRT. Which of the following is not true ?
   I. The beam-penetration is used with random scan monitors.
   II. Shadow-mask is used in rasterscan systems.
   III. Beam-penetration method is better than shadow-mask method.
   IV. Shadow-mask method is better than beam-penetration method.
   (a) I and II   (b) II and III   (c) III only   (d) IV only

2. Line caps are used for adjusting the shape of the line ends to give them a better appearance. Various kinds of line caps used are
   (a) Butt cap and sharp cap   (b) Butt cap and round cap
   (c) Butt cap, sharp cap and round cap   (d) Butt cap, round cap and projecting square cap

3. Given below are certain output primitives and their associated attributes. Match each primitive with its corresponding attributes :

List – I	List – II
A. Line	i. Type, Size, Color
B. Fill Area	ii. Color, Size, Font
C. Text	iii. Style, Color, Pattern
D. Marker	iv. Type, Width, Color

	A	B	C	D
(a)	i	ii	iii	iv
(b)	ii	i	iii	iv
(c)	iv	iii	ii	i
(d)	iii	i	iv	ii

4. Consider a window bounded by the lines : x = 0; y = 0; x = 5 and y = 3. The line segment joining (–1, 0) and (4, 5), if against this window will connect the points
   (a) (0, 1) and (2, 3)   (b) (0, 1) and (3, 3)   (c) (0, 1) and (4, 3)   (d) (0, 1) and (3, 2)

5. Which of the following color models are defined with three primary colors ?
   (a) RGB and HSV color models   (b) CMY and HSV color models
   (c) HSV and HLS color models   (d) RGB and CMY color models

6. In a digital transmission, the receiver clock is 0.1 percent faster than the sender clock. How many extra bits per second does the receiver receive if the data rate is 1 Mbps ?
   (a) 10 bps   (b) 100 bps   (c) 1000 bps   (d) 10000 bps

7. Given U = {1, 2, 3, 4, 5, 6, 7}
   A = {(3, 0.7), (5, 1), (6, 0.8)}
   then $\tilde{A}$ will be : (where $\sim \rightarrow$ complement)
   (a) {(4, 0.7), (2, 1), (1, 0.8)}   (b) {(4, 0.3), (5, 0), (6, 0.2)}
   (c) {(1, 1), (2, 1), (3, 0.3), (4, 1), (6, 0.2), (7, 1)}   (d) {(3, 0.3), (6.0.2)}

8. Consider a fuzzy set old as defined below
   Old = {(20, 0.1), (30, 0.2), (40, 0.4), (50, 0.6), (60, 0.8), (70, 1), (80, 1)}
   Then the alpha-cut for alpha = 0.4 for the set old will be

(a) {(40, 0.4)}

(b) {(50, 60, 70, 80)}

(c) {(20, 0), (30, 0.2)}

(d) {(20, 0), (30, 0), (40, 1), (50, 1), (60, 1), (70, 1), (80, 1)}

9. Perceptron learning, Delta learning and LMS learning are learning methods which falls under the category of

(a) Error correction learning – learning with a teacher

(b) Reinforcement learning – learning with a critic

(c) Hebbian learning

(d) Competitive learning – learning without a teacher

10. Code blocks allow many algorithms to be implemented with the following parameters :

(a) clarity, elegance, performance   (b) clarity, elegance, efficiency

(c) elegance, performance, execution   (d) execution, clarity, performance

11. Match the following with respect to the jump statements :

List – I	List – II
A. return	i. The conditional test and increment portions
B. goto	ii. A value associated with it
C. break	iii. Requires a label for operation
D. continue	iv. An exit from only the innermost loop

Codes :

	A	B	C	D
(a)	ii	iii	iv	i
(b)	iii	iv	i	ii
(c)	iv	iii	ii	i
(d)	iv	iii	i	ii

12. The control string in C++ consists of three important classifications of characters

(a) Escape sequence characters, Format specifiers and White-space characters

(b) Special characters, White-space characters and Non-white space characters

(c) Format specifiers, White-space characters and Non-white space characters

(d) Special characters, White-space characters and Format specifiers

13. Match the following with respect to I/O classes in object oriented programming :

List – I	List – II
A. fopen()	i. returns end of file
B. fclose()	ii. return for any problem report
C. ferror()	iii. returns 0
D. feof()	iv. returns a file pointer

Codes :

	A	B	C	D
(a)	iv	i	ii	iii
(b)	iii	i	iv	ii
(c)	ii	iii	iv	i
(d)	iv	iii	i	ii

14. Which one of the following describes the syntax of prolog program ?

I. Rules and facts are terminated by full stop (.)

II. Rules and facts are terminated by (;)

III. Variables names must start with upper case alphabets.

IV. Variables names must start with lower case alphabets.

Codes :

(a) I, II   (b) III, IV   (c) I, III   (d) II, IV

15. Let L be any language. Define even (w) as the strings obtained by extracting from w the letters in the even-numbered positions and even (L) = {even (w) | w ∈ L}. We define another language Chop (L) by removing the two leftmost symbols of every string in L given by Chop (L) = {w | ν w ∈ L, with | ν | = 2}. If L is regular language then
(a) even(L) is regular and Chop(L) is not regular.
(b) Both even(L) and Chop(L) are regular.
(c) even(L) is not regular and Chop(L) is regular.
(d) Both even(L) and Chop(L) are not regular.

16. Software testing is
(a) the process of establishing that errors are not present.
(b) the process of establishing confidence that a program does what it is supposed to do.
(c) the process of executing a program to show that it is working as per specifications.
(d) the process of executing a program with the intent of finding errors.

17. Assume that a program will experience 200 failures in infinite time. It has now experienced 100 failures. The initial failure intensity was 20 failures/CPU hr. Then the current failure intensity will be
(a) 5 failures/CPU hr   (b) 10 failures/CPU hr
(c) 20 failures/CPU hr   (d) 40 failures/CPU hr

18. Consider a project with the following functional units :
Number of user inputs = 50
Number of user outputs = 40
Number of user enquiries = 35
Number of user files = 06
Number of external interfaces = 04
Assuming all complexity adjustment factors and weighing factors as average, the function points for the project will be
(a) 135   (b) 722   (c) 675   (d) 672

19. Match the following :
List – I	List – II
A. Correctness	i. The extent to which a software tolerates the unexpected problems
B. Accuracy	ii. The extent to which a software meets its specifications
C. Robustness	iii. The extent to which a software has specified functions
D. Completeness	iv. Meeting specifications with precision

Codes :
	A	B	C	D
(a)	ii	iv	i	iii
(b)	i	ii	iii	iv
(c)	ii	i	iv	iii
(d)	iv	ii	i	iii

20. Which one of the following is not a definition of error ?
(a) It refers to the discrepancy between a computed, observed or measured value and the true, specified or theoretically correct value.
(b) It refers to the actual output of a software and the correct output.
(c) It refers to a condition that causes a system to fail.
(d) It refers to human action that results in software containing a defect or fault.

21. Which one of the following is not a key process area in CMM level 5 ?
(a) Defect prevention   (b) Process change management
(c) Software product engineering   (d) Technology change management

22. Consider the following relational schemas for a library database :
    Book (Title, Author, Catalog_no, Publisher, Year, Price)
    Collection (Title, Author, Catalog_no) with the following functional dependencies :
    I.   Title, Author → Catalog_no
    II. Catalog_no → Title, Author, Publisher, Year
    III. Publisher, Title, Year → Price
    Assume (Author, Title) is the key for both schemas. Which one of the following is true ?
    (a) Both Book and Collection are in BCNF.
    (b) Both Book and Collection are in 3NF.
    (c) Book is in 2NF and Collection in 3NF.
    (d) Both Book and Collection are in 2NF.

23. Specialization Lattice stands for
    (a) An entity type can participate as a subclass in only one specialization.
    (b) An entity type can participate as a subclass in more than one specialization.
    (c) An entity type that can participate in one specialization.
    (d) An entity type that can participate in one generalization.

24. Match the following :

List – I	**List – II**
A. Timeout ordering protocol	i. Wait for graph
B. Deadlock prevention	ii. Roll back
C. Deadlock detection	iii. Wait-die scheme
D. Deadlock recovery	iv. Thomas Write Rule

    Codes :

	A	B	C	D
(a)	iv	iii	i	ii
(b)	iii	ii	iv	i
(c)	ii	i	iv	iii
(d)	iii	i	iv	iii

25. Consider the schema
    R = {S, T, U, V}
    and the dependencies
    S → T, T → U, U → V and V → S
    If R = (R$_1$ and R$_2$) be a decomposition such that R$_1$ ∩ R$_2$ = φ then the decomposition is
    (a) not in 2NF   (b) in 2NF but not in 3NF
    (c) in 3NF but not in 2NF   (d) in both 2NF and 3NF

26. Which one of the following is not a Client-Server application ?
    (a) Internet chat   (b) Web browser   (c) E-mail   (d) Ping

27. Which one of the following concurrency protocol ensures both conflict serializability and freedom
    from deadlock :
    I.   2-phase locking
    II. Time phase ordering
    (a) Both I & II   (b) II only   (c) I only   (d) Neither I nor II

28. Match the following :

List – I	**List – II**
A. Expert systems	i. Pragmatics
B. Planning	ii. Resolution
C. Prolog	iii. Means-end analysis
D. Natural language processing	iv. Explanation facility

Codes :

	A	B	C	D
(a)	iii	iv	i	ii
(b)	iii	iv	ii	i
(c)	i	ii	iii	iv
(d)	iv	iii	ii	i

29. STRIPS addresses the problem of efficiently representing and implementation of a planner. It is not related to which one of the following ?
(a) SHAKEY   (b) SRI   (c) NLP   (d) None of these

30. Slots and facets are used in
(a) Semantic Networks   (b) Frames
(c) Rules   (d) All of these

31. Consider f(N) = g(N) + h(N)
Where function g is a measure of the cost of getting from the start node to the current node N and h is an estimate of additional cost of getting from the current node N to the goal node. Then f(N) = h(N) is used in which one of the following algorithms ?
(a) A* algorithm   (b) AO* algorithm
(c) Greedy best first search algorithm   (d) Iterative A* algorithm

32. _____ predicate calculus allows quantified variables to refer to objects in the domain of discourse and not to predicates or functions.
(a) Zero-order   (b) First-order   (c) Second-order   (d) High-order

33. _____ is used in game trees to reduce the number of branches of the search tree to be traversed without affecting the solution.
(a) Best first search   (b) Goal stack planning
(c) Alpha-beta pruning procedure   (d) Min-max search

34. Consider a uniprocessor system where new processes arrive at an average of five processes per minute and each process needs an average of 6 seconds of service time. What will be the CPU utilization ?
(a) 80%   (b) 50%   (c) 60%   (d) 30%

35. Consider a program that consists of 8 pages (from 0 to 7) and we have 4 page frames in the physical memory for the pages. The page reference string is :
1 2 3 2 5 6 3 4 6 3 7 3 1 5 3 6 3 4 2 4 3 4 5 1
The number of page faults in LRU and optimal page replacement algorithms are respectively (without including initial page faults to fill available page frames with pages) :
(a) 9 and 6   (b) 10 and 7   (c) 9 and 7   (d) 10 and 6

36. Which one of the following statements is not true about disk-arm scheduling algorithms ?
(a) SSTF (shortest seek time first) algorithm increases performance of FCFS.
(b) The number of requests for disk service are not influenced by file allocation method.
(c) Caching the directories and index blocks in main memory can also help in reducing disk arm movements.
(d) SCAN and C-SCAN algorithms are less likely to have a starvation problem.

37. _____ maintains the list of free disk blocks in the Unix file system.
(a) I-node   (b) Boot block   (c) Super block   (d) File allocation table

38. A part of windows 2000 operating system that is not portable is
(a) Device Management   (b) Virtual Memory Management
(c) Processor Management   (d) User Interface

39. Match the following with reference to Unix shell scripts :

	List – I		List – II
A.	$?	i.	File name of the current script
B.	$#	ii.	List of arguments
C.	$0	iii.	The number of arguments
D.	$*	iv.	Exit status of last command

Codes :

	A	B	C	D
(a)	iii	ii	i	iv
(b)	ii	iii	i	iv
(c)	iv	iii	i	ii
(d)	i	iii	i	iv

40. The advantage of _____ is that it can reference memory without paying the price of having a full memory address in the instruction.
(a) Direct addressing   (b) Indexed addressing
(c) Register addressing   (d) Register Indirect addressing

41. The reverse polish notation equivalent to the infix expression
$((A + B) * C + D)/(E + F + G)$
(a) A B + C * D + E F + G + /   (b) A B + C D * + E F + G + /
(c) A B + C * D + E F G + + /   (d) A B + C * D + E + F G + /

42. The output of a sequential circuit depends on
(a) present input only   (b) past input only
(c) both present and past input   (d) past output only

43. A byte addressable computer has a memory capacity of 2^m Kbytes and can perform 2^n operations. An instruction involving 3 operands and one operator needs a maximum of
(a) 3m bits   (b) m + n bits   (c) 3m + n bits   (d) 3m + n + 30 bits

44. Which of the following flip-flop is free from race condition ?
(a) T flip-flop   (b) SR flip-flop
(c) Master-slave JK flip-flop   (d) None of the above

45. One of the main features that distinguish microprocessor from micro-computers is
(a) words are usually larger in microprocessors.
(b) words are usually shorter in microprocessors.
(c) microprocessor does not contain I/O devices.
(d) None of the above.

46. The output generated by the LINUX command : $ seq 1 2 10 will be
(a) 1 2 10   (b) 1 2 3 4 5 6 7 8 9 10
(c) 1 3 5 7 9   (d) 1 5 10

47. All the classes necessary for windows programming are available in the module :
(a) win.txt   (b) win.main   (c) win.std   (d) MFC

48. Windows 32 API supports
(a) 16-bit Windows   (b) 32-bit Windows   (c) 64-bit Windows   (d) All of the above

49. Superficially the term "object-oriented", means that, we organize software as a
(a) collection of continuous objects that incorporates both data structure and behaviour.
(b) collection of discrete objects that incorporates both discrete structure and behaviour.
(c) collection of discrete objects that incorporates both data structure and behaviour.
(d) collection of objects that incorporates both discrete data structure and behaviour.

50. The "part-whole", or "a-part-of", relationship in which objects representing the components of something associated with an object representing the entire assembly is called as
(a) Association   (b) Aggregation   (c) Encapsulation   (d) Generalisation

51. The pure object oriented programming language with extensive metadata available and modifiable at run time is

(a) Small talk   (b) C++   (c) Java   (d) Eiffel

52. Match the following interfaces of Java. Servlet package :

List – I	**List – II**
A. Servlet Config	i. Enables Servlets to log events
B. Servlet Context	ii. Read data from a client
C. Servlet Request	iii. Write data to a client
D. Servlet Response	iv. To get initialization parameters

Codes :

	A	B	C	D
(a)	iii	iv	ii	i
(b)	iii	ii	iv	i
(c)	ii	iii	iv	i
(d)	iv	i	ii	iii

53. The syntax of capturing events method for document object is

(a) Capture Events ()   (b) Capture Events (Orgs events Type)

(c) Capture Events (event Type)   (d) Capture Events (event Val)

54. Linking to another place in the same or another webpage require two A (Anchor) tags, the first with the _____ attribute and the second with the _____ attribute.

(a) NAME & LINK   (b) LINK & HREF   (c) HREF & NAME   (d) TARGET & VALUE

55. Given an image of size 1024×1024 pixels in which intensity of each pixel is an 8-bit quality. It requires _____ of storage space if the image is not compressed.

(a) one Terabyte   (b) one Megabyte   (c) 8 Megabytes   (d) 8 Terabytes

56. Match the following cryptographic algorithms with their design issues :

List – I	**List – II**
A. DES	i. Message Digest
B. AES	ii. Public Key
C. RSA	iii. 56-bit key
D. SHA-1	iv. 128-bit key

Codes :

	A	B	C	D
(a)	ii	i	iv	iii
(b)	iii	i	iv	ii
(c)	iii	iv	ii	i
(d)	iv	i	ii	iii

57. Consider a code with five valid code words of length ten :

0000000000, 0000011111, 1111100000, 1110000011, 1111111111

Hamming distance of the code is

(a) 5   (b) 10   (c) 8   (d) 9

58. Which of the following special cases does not require reformulation of the problem in order to obtain a solution ?

(a) Alternate optimality   (b) Infeasibility

(c) Unboundedness   (d) All of the above

59. The given maximization assignment problem can be converted into a minimization problem by

(a) subtracting each entry in a column from the maximum value in that column.

(b) subtracting each entry in the table from the maximum value in that table.

(c) adding each entry in a column from the maximum value in that column.

(d) adding maximum value of the table to each entry in the table.

60. The initial basic feasible solution of the following transportion problem :

Destination

	D_1	D_2	D_3	Supply
O_1	2	7	4	5
Origins O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	

is given as

5		
		8
	7	
2	2	10

then the minimum cost is

(a) 76   (b) 78   (c) 80   (d) 82

61. Given the following equalities :

$E_1 : n^{K+\epsilon} + n^K \lg n = \theta(n^{K+\epsilon})$ for all fixed K and ϵ, $K \geq 0$ and $\epsilon > 0$.

$E_2 : n^3 2^n + 6n^2 3^n = O(n^3 2^n)$

Which of the following is true ?

(a) E_1 is correct and E_2 is correct.   (b) E_1 is correct and E_2 is not correct.

(c) E_1 is not correct and E_2 is correct.   (d) E_1 is not correct and E_2 is not correct.

62. Consider the fractional knapsack instance $n = 4$, $(p_1, p_2, p_3, p_4) = (10, 10, 12\ 18)$, $(w_1, w_2, w_3, w_4) =$

$(2, 4, 6, 9)$ and $M = 15$. The maximum profit is given by

(Assume p and w denotes profit and weight of objects respectively)

(a) 40   (b) 38   (c) 32   (d) 30

63. The solution of the recurrence relation of $T(n) = 3T\left(\text{floor}\left(\dfrac{n}{4}\right)\right) + n$ is

(a) $O(n^2)$ (b) $O(n\lg n)$ (c) $O(n)$ (d) $O(\lg n)$

64. If h is chosen from a universal collection of hash functions and is used to hash n keys into a table of size m, where $n \leq m$, the expected number of collisions involving a particular key K is

(a) less than 1   (b) less than $\lg n$ (c) greater than 1   (d) greater than $\lg n$

65. Given the following statements :

S_1 : The subgraph-isomorphism problem takes two graphs G_1 and G_2 and asks whether G_1 is a subgraph of G_2.

S_2 : The set-partition problem takes as input a set S of numbers and asks whether the numbers can be

partitioned into two sets A and $\overline{A} = S - A$ such that $\displaystyle\sum_{x \in A} x = \sum_{x \in \overline{A}} x$

Which of the following is true ?

(a) S_1 is NP problem and S_2 is P problem.   (b) S_1 is NP problem and S_2 is NP problem.

(c) S_1 is P problem and S_2 is P problem.   (d) S_1 is P problem and S_2 is NP problem.

66. Suppose that the splits at every level of quicksort are in the proportion $(1 - \alpha)$ to α, where $0 < \alpha \leq \dfrac{1}{2}$

is a constant. The minimum depth of a leaf in the recursion tree is approximately given by

(a) $-\dfrac{\lg n}{\lg(1-\alpha)}$ (b) $-\dfrac{\lg(1-\alpha)}{\lg n}$ (c) $-\dfrac{\lg n}{\lg \alpha}$ (d) $-\dfrac{\lg \alpha}{\lg n}$

67. Ten signals, each requiring 3000 Hz, are multiplexed on to a single channel using FDM. How much minimum bandwidth is required for the multiplexed channel ? Assume that the guard bands are 300 Hz wide.
(a) 30,000   (b) 32,700   (c) 33,000   (d) None of the above

68. A terminal multiplexer has six 1200 bps terminals and 'n' 300 bps terminals connected to it. If the outgoing line is 9600 bps, what is the value of n ?
(a) 4   (b) 8   (c) 16   (d) 28

69. Which of the following is used in the options field of IPv4 ?
(a) Strict source routing   (b) Loose source routing
(c) Time stamp   (d) All of the above

70. Which layers of the OSI reference model are host-to-host layers ?
(a) Transport, Session, Presentation, Application
(b) Network, Transport, Session, Presentation
(c) Data-link, Network, Transport, Session
(d) Physical, Data-link, Network, Transport

71. A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle ?
(a) 1024   (b) 2048   (c) 4096   (d) 8192

72. Four bits are used for packed sequence numbering in a sliding window protocol used in a computer network. What is the maximum window size ?
(a) 4   (b) 8   (c) 15   (d) 16

73. Given the following two grammars :
$G_1 : S \rightarrow AB \mid aaB$
     $A \rightarrow a \mid Aa$
     $B \rightarrow b$
$G_2 : S \rightarrow a S b S \mid b S a S \mid \lambda$
Which statement is correct ?
(a) G_1 is unambiguous and G_2 is unambiguous
(b) G_1 is unambiguous and G_2 is ambiguous
(c) G_1 is ambiguous and G_2 is unambiguous
(d) G_1 is ambiguous and G_2 is ambiguous

74. Match the following :

List – I	**List – II**
A. Chomsky Normal form	i. $S \rightarrow b S S \mid a S \mid c$
B. Greibach Normal form	ii. $S \rightarrow a S b \mid ab$
C. S-grammar	iii. $S \rightarrow AS \mid a$
	$A \rightarrow SA \mid b$
D. LL grammar	iv. $S \rightarrow a B S B$
	$B \rightarrow b$

Codes :

	A	**B**	**C**	**D**
(a)	iv	iii	i	ii
(b)	iv	iii	ii	i
(c)	iii	iv	i	ii
(d)	iii	iv	ii	i

75. Given the following two languages :

$L_1 = \{a^n b^n \mid n \geq 1\} \cup \{a\}$

$L_2 = \{w\, C\, w^R \mid w \in \{a, b\}*\}$

Which statement is correct ?
(a) Both L_1 and L_2 are not deterministic.
(b) L_1 is not deterministic and L_2 is deterministic.
(c) L_1 is deterministic and L_2 is not deterministic.
(d) Both L_1 and L_2 are deterministic.