

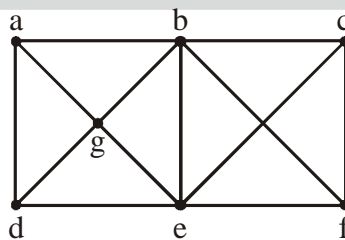
PAPER : JULY 2016

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-II

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.

- How many different equivalence relations with exactly three different equivalence classes are there on a set with five elements ?
(a) 10 (b) 15 (c) 25 (d) 30
- The number of different spanning trees in complete graph, K_4 and bipartite graph, $K_{2,2}$ have _____ and _____ respectively.
(a) 14, 14 (b) 16, 14 (c) 16, 4 (d) 14, 4
- Suppose that R_1 and R_2 are reflexive relations on a set A. Which of the following statements is correct ?
(a) $R_1 \cap R_2$ is reflexive and $R_1 \cup R_2$ is irreflexive
(b) $R_1 \cap R_2$ is irreflexive and $R_1 \cup R_2$ is reflexive
(c) Both $R_1 \cap R_2$ and $R_1 \cup R_2$ are reflexive
(d) Both $R_1 \cap R_2$ and $R_1 \cup R_2$ are irreflexive
- There are three cards in a box. Both sides of one card are black, both sides of one card are red, and the third card has one black side and one red side. We pick a card at random and observe only one side. What is the probability that the opposite side is the same color as the one side we observed ?
(a) $3/4$ (b) $2/3$ (c) $1/2$ (d) $1/3$
- A clique in a simple undirected graph is a complete that is not contained in any larger complete subgraph. How many cliques are there in the graph shown below ?



- (a) 2 (b) 4 (c) 5 (d) 6
- Which of the following logic expression is incorrect ?
(a) $1 \oplus 0 = 1$ (b) $1 \oplus 1 \oplus 1 = 1$ (c) $1 \oplus 1 \oplus 0 = 1$ (d) $1 \oplus 1 = 0$
- The IEEE-754 double-precision format to represent floating point numbers, has a length of _____ bits.
(a) 16 (b) 32 (c) 48 (d) 64

8. Simplified Boolean equation for the following truth table is :

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

- (a) $F = y\bar{z} + \bar{y}z$ (b) $F = x\bar{y} + \bar{x}y$ (c) $F = \bar{x}z + x\bar{z}$ (d) $F = \bar{x}z + x\bar{z} + xyz$

9. The simplified form of a Boolean equation $(A\bar{B} + A\bar{B}C + AC)(\bar{A}\bar{C} + \bar{B})$ is

- (a) $A\bar{B}$ (b) $A\bar{B}C$ (c) $\bar{A}\bar{B}$ (d) ABC

10. In a positive-edge-triggered JK flip-flop, if J and K both are high then the output will be _____ on the rising edge of the clock.

- (a) No change (b) Set (c) Reset (d) Toggle

11. Given $i = 0, j = 1, k = -1$
 $x = 0.5, y = 0.0$

What is the output of the following expression in C language ?

$x * y < i + j \parallel k$

- (a) -1 (b) 0 (c) 1 (d) 2

12. The following statement in 'C'

`int (*f())[];`
 declares

- (a) a function returning a pointer to an array of integers
 (b) a function returning an array of pointers to integers
 (c) array of functions returning pointers to integers
 (d) an illegal statement

13. Which one of the following is correct, when a class grants friend status to another class ?

- (a) The member functions of the class generating friendship can access the members of the friend class.
 (b) All member functions of the class granted friendship have unrestricted access to the members of the class granting the friendship.
 (c) Class friendship is reciprocal to each other.
 (d) There is no such concept.

14. When a method in a subclass has the same name and type signature as a method in the superclass, then the method in the subclass _____ the method in the superclass.

- (a) Overloads (b) Friendships (c) Inherits (d) Overrides

15. What is the value returned by the function f given below when $n = 100$?

```
int f(int n)
{ if (n == 0) then return n;
  else
```



- return $n + f(n - 2)$;
 }
 (a) 2550 (b) 2556 (c) 5220 (d) 5520
16. In RDBMS, the constraint that no key attribute (column) may be NULL is referred to as:
 (a) Referential integrity (b) Multi-valued dependency
 (c) Entity Integrity (d) Functional dependency
17. Which of the following statement(s) is/are FALSE in the context of Relational DBMS ?
 I. Views in a database system are important because they help with access control by allowing users to see only a particular subset of the data in the database.
 II. E-R diagrams are useful to logically model concepts.
 III. An update anomaly is when it is not possible to store information unless some other, unrelated information is stored as well.
 IV. SQL is a procedural language.
 (a) I, II and III only (b) III and IV only (c) I, II and III only (d) II, III and IV only
18. In a relational database model, NULL values can be used for all but which one of the following ?
 (a) To allow duplicate tuples in the table by filling the primary key column(s) with NULL.
 (b) To avoid confusion with actual legitimate data values like 0 (zero) for integer columns and "" (the empty string) for string columns.
 (c) To leave columns in a tuple marked as "unknown" when the actual value is unknown.
 (d) To fill a column in a tuple when that column does not really "exist" for that particular tuple.
19. Consider the following two commands C1 and C2 on the relation R from an SQL database:
 C1 : drop table R;
 C2 : delete from R;
 Which of the following statements is TRUE ?
 I. Both C1 and C2 delete the schema for R.
 II. C2 retains relation R, but deletes all tuples in R.
 III. C1 deletes not only all tuples of R, but also the schema for R.
 (a) I only (b) I and II only (c) II and III only (d) I, II and III
20. Consider the following database table having A, B, C and D as its four attributes and four possible candidate keys (I, II, III and IV) for this table:

A	B	C	D
a ₁	b ₁	c ₁	d ₁
a ₂	b ₃	c ₃	d ₁
a ₁	b ₂	c ₁	d ₂

I : {B}

II : {B, C}

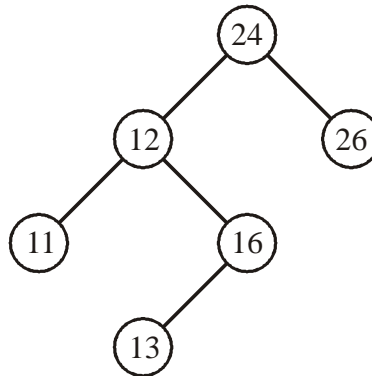
III : {A, D}

IV : {C, D}

If different symbols stand for different values in the table (e.g., d₁ is definitely not equal to d₂), then which of the above could not be the candidate key for the database table ?

- (a) I and III only (b) III and IV only (c) II only (d) I only

21. Consider the following binary search tree :



If we remove the root node, which of the node from the left subtree will be the new root ?

- (a) 11 (b) 12 (c) 13 (d) 16
22. Consider the following operations performed on a stack of size 5:
 Push (a); Pop (); Push (b); Push (c); Pop ();
 Push (d); Pop (); Pop (); Push (e)
 Which of the following statements is correct ?
 (a) Underflow occurs (b) Stack operations are performed smoothly
 (c) Overflow occurs (d) None of the above
23. Suppose you are given a binary tree with n nodes, such that each node has exactly either zero or two children. The maximum height of the tree will be
 (a) $\frac{n}{2} - 1$ (b) $\frac{n}{2} + 1$ (c) $\frac{(n-1)}{2}$ (d) $\frac{(n+1)}{2}$
24. Which of the following is not an inherent application of stack ?
 (a) Implementation of recursion (b) Evaluation of a postfix expression
 (c) Job scheduling (d) Reverse a string
25. In how many ways can the string $A \cap B - A \cap B - A$ be fully parenthesized to yield an infix expression ?
 (a) 15 (b) 14 (c) 13 (d) 12
26. A multiplexer combines four 100-Kbps channels using a time slot of 2 bits. What is the bit rate ?
 (a) 100 Kbps (b) 200 Kbps (c) 400 Kbps (d) 1000 Kbps
27. In a fully connected mesh network with 10 computers, total _____ number of cables are required and _____ number of ports are required for each device.
 (a) 40, 9 (b) 45, 10 (c) 45, 9 (d) 50, 10
28. In TCP/IP Reference model, the job of _____ layer is to permit hosts to inject packets into any network and travel them independently to the destination.
 (a) Physical (b) Transport (c) Application (d) Host-to-network
29. If there are N people in the world and are using secret key encryption/decryption for privacy purpose, then number of secret keys required will be :
 (a) N (b) (N - 1) (c) $\frac{N(N-1)}{2}$ (d) $\frac{N(N+1)}{2}$



30. Optical fiber uses reflection to guide light through a channel, in which angle of incidence is _____ the critical angle.
 (a) equal to (b) less than (c) greater than (d) less than or equal to
31. The number of strings of length 4 that are generated by the regular expression $(0|\epsilon)1+2^*(3|\epsilon)$, where | is an alternation character, {+, *} are quantification characters, and ϵ is the null string, is :
 (a) 08 (b) 10 (c) 11 (d) 12
32. The content of the accumulator after the execution of the following 8085 assembly language program is
 MVI A, 42H
 MVI B, 05H
 UGC : ADD B
 DCR B
 JNZ UGC
 ADI 25H
 HLT
 (a) 82 H (b) 78 H (c) 76 H (d) 47 H
33. In _____, the bodies of the two loops are merged together to form a single loop provided that they do not make any references to each other.
 (a) Loop unrolling (b) Strength reduction
 (c) Loop concatenation (d) Loop jamming
34. Which of the following is not typically a benefit of dynamic linking ?
 I. Reduction in overall program execution time.
 II. Reduction in overall space consumption in memory.
 III. Reduction in overall space consumption in disk.
 IV. Reduction in the cost of software updates.
 (a) I and IV (b) I only (c) II and III (d) IV only
35. Which of the following is FALSE ?
 (a) The grammar $S \rightarrow aSb | bSa | SS | \epsilon$, where S is the only non-terminal symbol and ϵ is the null string, is ambiguous.
 (b) SLR is powerful than LALR.
 (c) An LL(1) parser is a top-down parser.
 (d) YACC tool is an LALR(1) parser generator.
36. Consider the reference string
 0 1 2 3 0 1 4 0 1 2 3 4
 If FIFO page replacement algorithm is used, then the number of page faults with three page frames and four page frames are _____ and _____ respectively.
 (a) 10, 9 (b) 9, 9 (c) 10, 10 (d) 9, 10

37. Suppose there are four processes in execution with 12 instances of a Resource R in a system. The maximum need of each process and current allocation are given below:

Process	Max. Need	Current Allocation
P ₁	8	3
P ₂	9	4
P ₃	5	2
P ₄	3	1

With reference to current allocation, is system safe ? If so, what is the safe sequence ?

- (a) No (b) Yes, P₁P₂P₃P₄ (c) Yes, P₄P₃P₂P₁ (d) Yes, P₂P₁P₃P₄
38. If the Disk head is located initially at track 32, find the number of disk moves required with FCFS scheduling criteria if the disk queue of I/O blocks request are :
- (a) 320 (b) 322 (c) 321 (d) 319
39. In UNIX, _____ creates three subdirection : 'PIS' and two subdirectories 'progs' and 'data' from just created subdirectory 'PIS'.
- (a) mkdir PIS/progs PIS/data PIS (b) mkdir PIS progs data
(c) mkdir PIS PIS/progs PIS/data (d) mkdir PIS/progs data
40. A scheduling algorithm assigns priority proportional to the waiting time of process. Every process starts with priority zero (lowest priority). The scheduler reevaluates the process priority for every 'T' time units and decides next process to be scheduled. If the process have no I/O operations and all arrive at time zero, then the scheduler implements _____ criteria.
- (a) Priority scheduling (b) Round Robin Scheduling
(c) Shortest Job First (d) FCFS
41. If S₁ is total number of modules defined in the program architecture, S₃ is the number of modules whose correct function depends on prior processing then the number of modules not dependent on prior processing is:
- (a) $1 + \frac{S_3}{S_1}$ (b) $1 - \frac{S_3}{S_1}$ (c) $1 + \frac{S_1}{S_3}$ (d) $1 - \frac{S_1}{S_3}$
42. The _____ model is preferred for software development when the requirements are not clear.
- (a) Rapid Application Development (b) Rational Unified Process
(c) Evolutionary Model (d) Waterfall Model
43. Which of the following is not included in waterfall model ?
- (a) Requirement analysis (b) Risk analysis
(c) Design (d) Coding
44. The cyclomatic complexity of a flow graph V(G), in terms of predicate nodes is:
- (a) P + 1 (b) P - 1 (c) P - 2 (d) P + 2
45. The extent to which a software tolerates the unexpected problems, is termed as :
- (a) Accuracy (b) Reliability (c) Correctness (d) Robustness



46. An attacker sits between customer and Banker, and captures the information from the customer and retransmits to the banker by altering the information. This attack is called as_____.
- (a) Masquerade Attack (b) Replay Attack
(c) Passive Attack (d) Denial of Service Attack
47. Consider the following two statements :
- (A) Business intelligence and Data warehousing is used for forecasting and Data mining.
(B) Business intelligence and Data warehousing is used for analysis of large volumes of sales data.
Which one of the following options is correct ?
- (a) (A) is true, (B) is false (b) Both (A) and (B) are true
(c) (A) is false, (B) is true (d) Both (A) and (B) are false
48. Pipelining improves performance by:
- (a) decreasing instruction latency (b) eliminating data hazards
(c) exploiting instruction level parallelism (d) decreasing the cache miss rate
49. Consider the following two statements:
- (A) Data scrubbing is a process to upgrade the quality of data, before it is moved into Data warehouse.
(B) Data scrubbing is a process of rejecting data from data warehouse to create indexes.
Which one of the following options is correct ?
- (a) (A) is true, (B) is false (b) (A) is false, (B) is true
(c) Both (A) and (B) are false (d) Both (A) and (B) are true
50. Given the following statements:
- (A) Strategic value of data mining is timestamping
(B) Information collection is an expensive process in building an expert system
Which of the following options is correct ?
- (a) Both (A) and (B) are false (b) Both (A) and (B) are true
(c) (A) is true, (B) is false (d) (A) is false, (B) is true

PAPER : JULY 2016

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-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. Which of the following is a sequential circuit?
(a) Multiplexer (b) Decoder (c) Counter (d) Full adder
2. 8085 microprocessor has _____ hardware interrupts
(a) 2 (b) 3 (c) 4 (d) 5
3. Which of the following in 8085 microprocessor performs
HL = HL + DE ?
(a) DAD D (b) DAD H (c) DAD B (d) DAD SP
4. The register that stores all interrupt requests is
(a) interrupt mask register (b) interrupt service register
(c) interrupt request register (d) status register
5. The _____ addressing mode is similar to register indirect addressing mode, except that an offset is added to the contents of the register. The offset and register are specified in the instruction.
(a) base indexed (b) base indexed plus displacement
(c) indexed (d) displacement
6. In _____ method, the word is written to the block in both the cache and main memory, in parallel
(a) write through (b) write back (c) write protected (d) direct mapping
7. Which of the following statements concerning Object-Oriented database is FALSE?
(a) Objects in an object-oriented database contain not only data but also methods for processing the data
(b) Object-oriented databases store computational instructions in the same place as the data
(c) Object-oriented databases are more adapt at handling structured (analytical) data than relational databases
(d) Object-oriented databases store more types of data than relational databases and access that data faster
8. In distributed databases, location transparency allows for database users, programmers and administrators to treat the data as if it is at one location. A SQL query with location transparency needs to specify:
(a) Inheritances (b) Fragments (c) Locations (d) Local formats
9. Consider the relations R(A, B) and S(B, C) and the following four relational algebra queries over R and S:
(I) $\Pi_{A,B}(R \bowtie S)$ (II) $R \bowtie \Pi_B(S)$ (III) $R \cap (\Pi_A(R) \times \Pi_B(S))$
(IV) $\Pi_{A,R,B}(R \times S)$ where R.B refers to the column B in table R
One can determine that:
(a) I, III and IV are the same query (b) II, III and IV are the same query
(c) I, II and IV are the same query (d) I, II and III are the same query



10. Which of the following statements is TRUE?
 D_1 : The decomposition of the schema $R(A, B, C)$ into $R_1(A, B)$ and $R_2(A, C)$ is always
 D_2 : The decomposition of the schema $R(A, B, C, D, E)$ having $AD \rightarrow B, C \rightarrow DE, B \rightarrow AE$ and $AE \rightarrow C$, into $R_1(A, B, D)$ and $R_2(A, C, D, E)$ is lossless.
 (a) Both D_1 and D_2 (b) Neither D_1 nor D_2
 (c) only D_1 (d) only D_2
11. Consider the following ORACLE relations :
 $R(A, B, C) = \{ \langle 1, 2, 3 \rangle, \langle 1, 2, 0 \rangle, \langle 1, 3, 1 \rangle, \langle 6, 2, 3 \rangle, \langle 1, 4, 2 \rangle, \langle 3, 1, 4 \rangle \}$
 $S(B, C, D) = \{ \langle 2, 3, 7 \rangle, \langle 1, 4, 5 \rangle, \langle 1, 2, 3 \rangle, \langle 2, 3, 4 \rangle, \langle 3, 1, 4 \rangle \}$.
 Consider the following two SQL queries SQ_1 and SQ_2 :
 SQ_1 : `SELECT R.B, AVG(S.B)`
`FROM R, S`
`WHERE R.A = S.C AND S.D < 7`
`GROUP BY R.B;`
 SQ_2 : `SELECT DISTINCT S.B, MIN(S.C)`
`FROM S`
`GROUP BY S.B`
`HAVING COUNT(DISTINCT S.D) > 1;`
 If M is the number of tuples returned by SQ_1 and N is the number of tuples returned by SQ_2 then
 (a) $M = 4, N = 2$ (b) $M = 5, N = 3$ (c) $M = 2, N = 2$ (d) $M = 3, N = 3$
12. Semi-join strategies are techniques for query processing in distributed database system. Which of the following is a semi-join technique ?
 (a) Only the joining attributes are sent from one site to another and then all of the rows are returned.
 (b) All of the attributes are sent from one site to another and then only the required rows are returned.
 (c) Only the joining attributes are sent from one site to another and then only the required rows are returned.
 (d) All of the attributes are sent from one site to another and then only the required rows are returned.
13. Consider the Bresenham's circle generation algorithm for plotting a circle with center $(0, 0)$ and radius 'r' units in first quadrant. If the current point is (x_i, y_i) and decision parameter is p_i then what will be the next point (x_{i+1}, y_{i+1}) and updated decision parameter p_{i+1} for $p_i \geq 0$?
 (a) $x_{i+1} = x_i + 1$
 $y_{i+1} = y_i$
 $p_{i+1} = p_i + 4x_i + 6$
 (b) $x_{i+1} = x_i + 1$
 $y_{i+1} = y_i - 1$
 $p_{i+1} = p_i + 4(x_i - y_i) + 10$
 (c) $x_{i+1} = x_i$
 $y_{i+1} = y_i - 1$
 $p_{i+1} = p_i + 4(x_i - y_i) + 6$
 (d) $x_{i+1} = x_i - 1$
 $y_{i+1} = y_i$
 $p_{i+1} = p_i + 4x_i + 10$
14. A point $P(5, 1)$ is rotated by 90° about a pivot point $(2, 2)$. What is the coordinate of new transformed point P' ?
 (a) $(3, 5)$ (b) $(5, 3)$ (c) $(2, 4)$ (d) $(1, 5)$

15. Let R be the rectangular window against which the lines are to be clipped using 2D Sutherland-Cohen line clipping algorithm. The rectangular window has lower left-hand corner at $(-5, 1)$ and upper right-hand corner at $(3, 7)$. Consider the following three lines for clipping with the given end point coordinates:
 Line AB : A $(-6, 2)$ and B $(-1, 8)$
 Line CD : C $(-1, 5)$ and D $(4, 8)$
 Line EF : E $(-2, 3)$ and F $(1, 2)$
 Which of the following line(s) is/are candidate for clipping ?
 (a) AB (b) CD (c) EF (d) AB and CD
16. In perspective projection, if a line segment joining a point which lies in front of the viewer to a point in back of the viewer is projected to a broken line of infinite extent. This is known as _____.
 (a) View confusion (b) Vanishing point
 (c) Topological distortion (d) Perspective foreshortening
17. Let us consider that the original point is (x, y) and new transformed point is (x', y') . Further, Sh_x and Sh_y are shearing factors in x and y direction. If we perform the y -direction shear relative to $x = x_{ref}$ then the transformed point is given by _____.
 (a) $x' = x + Sh_x \cdot (y - y_{ref})$
 $y' = y$
 (b) $x' = x$
 $y' = y \cdot Sh_x$
 (c) $x' = x$
 $y' = Sh_y (x - x_{ref}) + y$
 (d) $x' = Sh_y \cdot y$
 $y' = y \cdot (x - x_{ref})$
18. Which of the following statement(s) is/are correct with reference to curve generation ?
 I. Hermite curves are generated using the concepts of interpolation.
 II. Bezier curves are generated using the concepts of approximation.
 III. The Bezier curve lies entirely within the convex hull of its control points.
 IV. The degree of Bezier curve does not depend on the number of control points.
 (a) I, II and IV only (b) II and III only (c) I and II only (d) I, II and III only
19. Given the following statements :
 (A) To implement Abstract Data Type, a programming language require a syntactic unit to encapsulate type definition.
 (B) To implement ADT, a programming language requires some primitive operations that are built in the language processor.
 (C) C++, Ada, Java 5.0, C#2005 provide support for parameterised ADT.
 Which one of the following options is correct ?
 (a) (A), (B) and (C) are false (b) (A) and (B) are true; (C) is false
 (c) (A) is true; (B) and (C) are false (d) (A), (B) and (C) are true
20. Match the following types of variables with the corresponding programming languages :
 A. Static variables i. Local variables in Pascal
 B. Stack dynamic ii. All variable in APL
 C. Explict heap dynamic iii. Fortran 77
 D. Implict heap dynamic iv. All objects in JAVA

**Codes:**

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

21. Which of the following is false regarding the evaluation of computer programming languages ?
 (a) Application oriented features (b) Efficiency and Readability
 (c) Software development (d) Hardware maintenance cost
22. The symmetric difference of two sets S_1 and S_2 is defined as
 $S_1 \ominus S_2 = \{x \mid x \in S_1 \text{ or } x \in S_2, \text{ but } x \text{ is not in both } S_1 \text{ and } S_2\}$
 The nor of two languages is defined as $\text{nor}(L_1, L_2) = \{w \mid w \notin L_1 \text{ and } w \notin L_2\}$
 Which of the following is correct ?
 (a) The family of regular languages is closed under symmetric difference but not closed under nor.
 (b) The family of regular languages is closed under nor but not closed under symmetric difference.
 (c) The family of regular languages are closed under both symmetric difference and nor.
 (d) The family of regular languages are not closed under both symmetric difference and nor.
23. The regular expression for the complement of the language $L = \{a^n b^m \mid n \geq 4, m \leq 3\}$ is:
 (a) $(\lambda + a + aa + aaa) b^* + a^* bbbb^* + (a + b)^* ba(a + b)^*$
 (b) $(\lambda + a + aa + aaa) b^* + a^* bbbbbb^* + (a + b)^* ab(a + b)^*$
 (c) $(\lambda + a + aa + aaa) + a^* bbbbbb^* + (a + b)^* ab(a + b)^*$
 (d) $(\lambda + a + aa + aaa) b^* + a^* bbbbbb^* + (a + b)^* ba(a + b)^*$
24. Consider the following two languages :
 $L_1 = \{0^i 1^j \mid \text{gcd}(i, j) = 1\}$
 L_2 is any subset of 0^* .
 Which of the following is correct ?
 (a) L_1 is regular and L_2^* is not regular (b) L_1 is not regular and L_2^* is regular
 (c) Both L_1 and L_2^* are regular languages (d) Both L_1 and L_2^* are not regular languages
25. If think transmits 4000 frames per second and each slot has 8 bits, the transmission rate of circuit of this TDM is_____.
 (a) 64 Kbps (b) 32 Mbps (c) 32 Kbps (d) 64 Mbps
26. Given the following statements :
 (A) Frequency Division Multiplexing is a technique that can be applied when the bandwidth of a link is greater than combined bandwidth of signals to be transmitted.
 (B) Wavelength Division Multiplexing (WDM) is an analog multiplexing technique to combine optical signals.
 (C) WDM is a Digital Multiplexing Technique.
 (D) TDM is a Digital Multiplexing Technique.
 Which of the following is correct ?
 (a) (A), (B), (C) and (D) are true (b) (A), (B), (C) and (D) are false
 (c) (A), (B) and (D) are false; (C) is true (d) (A), (B) and (D) are true; (C) is false

27. A pure ALOHA Network transmits 200 bit frames using a shared channel with 200 Kbps bandwidth. If the system (all stations put together) produces 500 frames per second, then the throughput of the system is_____.
- (a) 0.384 (b) 0.184 (c) 0.286 (d) 0.586
28. Match the following:
- | | |
|--------------------------|---|
| A. Line coding | i. A technique to change analog signal to digital data. |
| B. Block coding | ii. Provides synchronization without increasing number of bits |
| C. Scrambling | iii. Process of converting digital data to digital signal. |
| D. Pulse code modulation | iv. Provides redundancy to ensure synchronization and inherits error detection. |

Codes:

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

29. Assume that we need to download text documents at the rate of 100 pages per minute. A page is an average of 24 lines with 80 characters in each line and each character requires 8 bits. Then the required bit rate of the channel is_____.
- (a) 1.636 Kbps (b) 1.636 Mbps (c) 3.272 Mbps (d) 3.272 Kbps
30. Encrpt the plain text Message “EXTRANET” using Transposition cipher technique with the following key:

3	5	2	1	4	(Cipher text)
1	2	3	4	5	(Plain text)

- (a) TAXERTZENZ (b) EXTRANETZZ (c) EZXZTRZANZET (d) EXTZRANZETZ
31. The number of different binary trees with 6 nodes is_____.
- (a) 6 (b) 42 (c) 132 (d) 256
32. Let $A[1..n]$ be an array of n distinct numbers. If $i < j$ and $A[i] > A[j]$ then the pair (i, j) is called an inversion of A . What is the expected number of inversions in any permutation on n elements ?
- (a) $\theta(n)$ (b) $\theta(\lg n)$ (c) $\theta(n \lg n)$ (d) $\theta(n^2)$
33. Which one of the following array represents a binary max-heap ?
- (a) [26, 13, 17, 14, 11, 9, 15] (b) [26, 15, 14, 17, 11, 9, 13]
- (c) [26, 15, 17, 14, 11, 9, 13] (d) [26, 15, 13, 14, 11, 9, 17]
34. Match the following:
- | | |
|----------------------------------|-------------------|
| A. Huffman codes | i. $O(n^2)$ |
| B. Optimal polygon triangulation | ii. $\theta(n^3)$ |
| C. Activity selection problem | iii. $O(n \lg n)$ |
| D. Quicksort | iv. $\theta(n)$ |

Codes:

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



35. Suppose that we have numbers between 1 and 1,000 in a binary search tree and want to search for the number 364. Which of the following sequence could not be the sequence of nodes examined ?
(a) 925, 221, 912, 245, 899, 259, 363, 364 (b) 3, 400, 388, 220, 267, 383, 382, 279, 364
(c) 926, 203, 912, 241, 913, 246, 364 (d) 3, 253, 402, 399, 331, 345, 398, 364
36. A triangulation of a polygon is a set of T chords that divide the polygon into disjoint triangles. Every triangulation of n vertex convex polygon has _____ chords and divides the polygon into _____ triangles.
(a) $n-2, n-1$ (b) $n-3, n-2$ (c) $n-1, n$ (d) $n-2, n-2$
37. Implicit return type of a class constructor is :
(a) not of class type itself (b) class type itself
(c) a destructor of class type (d) a destructor not of class type
38. It is possible to define a class within a class termed as nested class. There are _____ types of nested classes.
(a) 2 (b) 3 (c) 4 (d) 5
39. Which of the following statements is correct ?
(a) Aggregation is a strong type of association between two classes with full ownership.
(b) Aggregation is a strong type of association between two classes with partial ownership.
(c) Aggregation is a weak type of association between two classes with partial ownership.
(d) Aggregation is a weak type of association between two classes with full ownership.
40. Which of the following statement is correct ?
(a) Every class containing abstract method must not be declared abstract.
(b) Abstract class cannot be directly initiated with 'new' operator.
(c) Abstract class cannot be initiated.
(d) Abstract class contains definition of implementation.
41. Which of the following statements is not correct ?
(a) HTML is not screen precise formatting language.
(b) HTML does not specify a logic.
(c) DHTML is used for developing highly interactive web pages.
(d) HTML is a programming language.
42. When one object reference variable is assigned to another object reference variable then
(a) a copy of the object is created
(b) a copy of the reference is created
(c) a copy of the reference is not created
(d) It is illegal to assign one object reference variable to another object reference variable
43. A server crashes on the average once in 30 days, that is the Mean Time Between Failures (MTBF) is 30 days. When this happens, it takes 12 hours to reboot it, that is the Mean Time to Repair (MTTR) is 12 hours. The availability of server with these reliability data values is approximately:
(a) 96.3 % (b) 97.3 % (c) 98.3 % (d) 99.3 %
44. Match the software maintenance activities in List-I to its meaning in List-II.
List-I
A. Corrective
B. Adaptive
C. Perfective
D. Preventive

List-II

- i. Concerned with performing activities to reduce the software complexity thereby improving program understandability and increasing software maintainability.
- ii. Concerned with fixing errors that are observed when the software is in use.
- iii. Concerned with the change in the software that takes place to make the software adaptable to new environment (both hardware and software).
- iv. Concerned with the change in the software that takes place to make the software adaptable to changing user requirements.

Codes:

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

45. Match each application/software design concept in List-I to its definition in List-II

List-I

- A. Coupling
- B. Cohesion
- C. Scalable
- D. Readable

List-II

- i. Easy to visually inspect the design of the software and understand its purpose.
- ii. Easy to add functionally to a software without having to redesign it.
- iii. Focus of a code upon a single goal.
- iv. Reliance of a code module upon other code modules.

Codes:

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

46. Software safety is quality assurance activity that focuses on hazards that
- (a) affect the reliability of a software component.
 - (b) may cause an entire system to fail.
 - (c) may result from user input errors.
 - (d) prevent profitable marketing of the final product.
47. Which of the following sets represent five stages defined by Capability Maturity Model (CMM) in increasing order of maturity ?
- (a) Initial, Defined, Repeatable, Managed, Optimized
 - (b) Initial, Repeatable, Defined, Managed, Optimized
 - (c) Initial, Defined, Managed, Repeatable, Optimized
 - (d) Initial, Repeatable, Managed, Defined, Optimized



48. The number of function points of a proposed system is calculated as 500. Suppose that the system is planned to be developed in Java and the LOC/FP ratio of Java is 50. Estimate the effort (E) required to complete the project using the effort formula of basic COCOMO given below:
- $$E = a(KLOC)^b$$
- Assume that the values of a and b are 2.5 and 1.0 respectively.
- (a) 25 person months (b) 75 person months
(c) 62.5 person months (d) 72.5 person months
49. In UNIX, processes that have finished execution but have not yet had their status collected are known as_____.
- (a) Sleeping processes (b) Stopped processes
(c) Zombie processes (d) Orphan processes
50. In Unix operating system, when a process creates a new process using the fork () system call, which of the following state is shared between the parent process and child process ?
- (a) Heap (b) Stack
(c) Shared memory segments (d) Both Heap and Stack
51. Which of the following information about the UNIX file system is not correct ?
- (a) Super block contains the number of i-nodes, the number of disk blocks, and the start of the list of free disk blocks.
(b) An i-node contains accounting information as well as enough information to locate all the disk blocks that holds the file's data.
(c) Each i-node is 256 bytes long.
(d) All the files and directories are stored in data blocks.
52. Which of the following option with reference to UNIX operating system is not correct ?
- (a) INT signal is sent by the terminal driver when one types <Control-C> and it is a request to terminate the current operation.
(b) TERM is a request to terminate execution completely. The receiving process will clean up its state and exist.
(c) QUIT is similar to TERM except that it defaults to producing a core dump if not caught.
(d) KILL is a blockable signal.
53. A multicomputer with 256 CPUs is organized as 16×16 grid. What is the worst case delay (in hops) that a message might have to take ?
- (a) 16 (b) 15 (c) 32 (d) 30
54. Suppose that the time to do a null remote procedure call (RPC) (i.e., 0 data bytes) is 1.0 msec, with an additional 1.5 msec for every 1 K of data. How long does it take to read 32 K from the file server as 32 1 K RPCs ?
- (a) 49 msec (b) 80 msec (c) 48 msec (d) 100 msec
55. Let L be the language generated by regular expression 0^*10^* and accepted by the deterministic finite automata M. Consider the relation R_M defined by M. As all states are reachable from the start state, R_M has_____equivalence classes.
- (a) 2 (b) 4 (c) 5 (d) 6

56. Let $L = \{0^n 1^n \mid n \geq 0\}$ be a context free language.
Which of the following is correct ?
- (a) L is context free and L^k is not context free for any $k \geq 1$
 (b) L is not context free and L^k is context free for any $k \geq 1$
 (c) Both L and L^k is for any $k \geq 1$ are context free
 (d) Both L and L^k is for any $k \geq 1$ are not context free
57. Given a Turing Machine $M = (\{q_0, q_1, q_2, q_3\}, \{a, b\}, \{a, b, B\}, \delta, B, \{q_3\})$, where δ is a transition function defined as
- $\delta(q_0, a) = (q_1, a, R)$
 $\delta(q_1, b) = (q_2, b, R)$
 $\delta(q_2, a) = (q_2, a, R)$
 $\delta(q_2, b) = (q_3, b, R)$
- The language $L(M)$ accepted by the Turing Machine is given as:
- (a) aa^*b (b) $abab$ (c) aba^*b (d) aba^*
58. Consider a discrete memoryless channel and assume that $H(x)$ is the amount of information per symbol at the input of the channel; $H(y)$ is the amount of information per symbol at the output of the channel; $H(x|y)$ is the amount of uncertainty remaining on x knowing y ; and $I(x; y)$ is the formation transmission.
- Which of the following does not define the channel capacity of a discrete memoryless channel ?
- (a) $\max_{p(x)} I(x; y)$ (b) $\max_{p(x)} [H(y) - H(y|x)]$
 (c) $\max_{p(x)} [(H(x) - H(x|y))]$ (d) $\max_{p(x)} H(x|y)$
59. Consider a source with symbols A, B, C, D with probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}$ respectively. What is the average number of bits per symbol for the Huffman code generated from above information ?
- (a) 2 bits per symbol (b) 1.75 bits per symbol
 (c) 1.50 bits per symbol (d) 1.25 bits per symbol
60. Which of the following is used for the boundary representation of an image object ?
- (a) Quad Tree (b) Projections (c) Run length coding (d) Chain codes
61. The region of feasible solution of a linear programming problem has a _____ property in geometry, provided the feasible solution of the problem exists.
- (a) concavity (b) convexity (c) quadratic (d) polyhedron
62. Consider the following statements:
1. Revised simplex method requires lesser computations than the simplex method.
 2. Revised simplex method automatically generates the inverse of the current basis matrix.
 3. Less number of entries are needed in each table of revised simplex method than usual simplex method.
- Which of these statements are correct ?
- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3



63. The following transportation problem:

	A	B	C	Supply
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Demand	4	2	2	

has a solution

	A	B	C
I	1		
II	3	0	
III		2	2

The above solution of a given transportation problem is

- (a) infeasible solution (b) optimum solution
(c) non-optimum solution (d) unbounded solution
64. Let R and S be two fuzzy relations defined as:

$$R = \begin{matrix} & y_1 & y_2 \\ x_1 & \begin{bmatrix} 0.7 & 0.5 \end{bmatrix} \\ x_2 & \begin{bmatrix} 0.8 & 0.4 \end{bmatrix} \end{matrix} \text{ and } S = \begin{matrix} & z_1 & z_2 & z_3 \\ y_1 & \begin{bmatrix} 0.9 & 0.6 & 0.2 \end{bmatrix} \\ y_2 & \begin{bmatrix} 0.1 & 0.7 & 0.5 \end{bmatrix} \end{matrix}.$$

Then the resulting T, which relates elements of uni-

verse x to elements of universe z using max-min composition is given by

$$(a) T = \begin{matrix} & z_1 & z_2 & z_3 \\ x_1 & \begin{bmatrix} .5 & .7 & .5 \end{bmatrix} \\ x_2 & \begin{bmatrix} .8 & .8 & .8 \end{bmatrix} \end{matrix} \quad (b) T = \begin{matrix} & z_1 & z_2 & z_3 \\ x_1 & \begin{bmatrix} .5 & .7 & .5 \end{bmatrix} \\ x_2 & \begin{bmatrix} .9 & .6 & .5 \end{bmatrix} \end{matrix}$$

$$(c) T = \begin{matrix} & z_1 & z_2 & z_3 \\ x_1 & \begin{bmatrix} 0.7 & 0.6 & 0.5 \end{bmatrix} \\ x_2 & \begin{bmatrix} 0.8 & 0.6 & 0.4 \end{bmatrix} \end{matrix} \quad (d) T = \begin{matrix} & z_1 & z_2 & z_3 \\ x_1 & \begin{bmatrix} 0.7 & 0.6 & 0.5 \end{bmatrix} \\ x_2 & \begin{bmatrix} 0.8 & 0.8 & 0.8 \end{bmatrix} \end{matrix}$$

65. Compute the value of adding the following two fuzzy integers:

$$A = \{(0.3, 1), (0.6, 2), (1, 3), (0.7, 4), (0.2, 5)\}$$

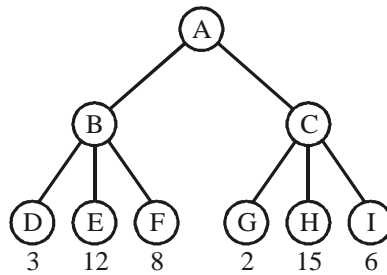
$$B = \{(0.5, 11), (1, 12), (0.5, 13)\}$$

Where fuzzy addition is defined as $\mu_{A+B}(z) = \max_{x+y=z} (\min(\mu_A(x), \mu_B(x)))$. Then, $f(A+B)$ is equal to

- (a) $\{(0.5, 12), (0.6, 13), (1, 14), (0.7, 15), (0.7, 16), (1, 17), (1, 18)\}$
 (b) $\{(0.5, 12), (0.6, 13), (1, 14), (1, 15), (1, 16), (1, 17), (1, 18)\}$
 (c) $\{(0.3, 12), (0.5, 13), (0.5, 14), (1, 15), (0.7, 16), (0.5, 17), (0.2, 18)\}$
 (d) $\{(0.3, 12), (0.5, 13), (0.6, 14), (1, 15), (0.7, 16), (0.5, 17), (0.2, 18)\}$
66. A perceptron has input weight $W_1 = -3.9$ and $W_2 = 1.1$ with threshold value $T = 0.3$. What output does it gives for the input $x_1 = 1.3$ and $x_2 = 2.2$?
- (a) -2.65 (b) -2.30 (c) 0 (d) 1

67. What is the function of following UNIX command ?
 $WC -l < a > b \&$
- (a) It runs the word count program to count the number of lines in its input, a, writing the result to b, as a foreground process.
 - (b) It runs the word count program to count the number of lines in its, a, writing the result to b, but does it in the background.
 - (c) It counts the errors during the execution of a process, a, and puts the result in process b.
 - (d) It copies the 'l' numbers of lines of program from file, a, and stores in file b.
68. Which of the following statement is not correct with reference to cron daemon in UNIX O.S. ?
- (a) The cron daemon is the standard tool for running commands on a pre-determined schedule.
 - (b) It starts when the system boots and runs as long as the system is up.
 - (c) Cron reads configuration files that contains list of command lines and the times at which they invoked.
 - (d) Crontab for individual users are not stored.
69. In Unix, files can be protected by assigning each one a 9-bit mode called rights bits. Now, consider the following two statements :
- I. A mode of 641 (octal) means that the owner can read and write the file, other members of the owner's group can read it, and users can execute only.
 - II. A mode of 100 (octal) allows the owner to execute the file, but prohibits all other access.
- Which of the following options is correct with reference to above statements ?
- (a) Only I is correct
 - (b) Only II is correct
 - (c) Both I and II are correct
 - (d) Both I and II are incorrect
70. Consider the statement,
"Either $-2 \leq x \leq -1$ or $1 \leq x \leq 2$ ".
The negation of this statement is
- (a) $x < -2$ or $2 < x$ or $-1 < x < 1$
 - (b) $x < -2$ or $2 < x$
 - (c) $-1 < x < 1$
 - (d) $x \leq -2$ or $2 \leq x$ or $-1 < x < 1$
71. Which of the following is characteristic of an MIS ?
- (a) Provides guidance in identifying problems, finding and evaluating alternative solutions, and selecting or comparing alternatives.
 - (b) Draws on diverse yet predictable data resources to aggregate and summarize data.
 - (c) High volume, data capture focus.
 - (d) Has as its goal the efficiency of data movement and processing and interfacing different TPS.
72. How does randomized hill-climbing choose the next move each time ?
- (a) It generates a random move from the moveset, and accepts this move.
 - (b) It generates a random move from the whole state space, and accepts this move.
 - (c) It generates a random move from the moveset, and accepts this move only if this move improves the evaluation function.
 - (d) It generates a random move from the whole state space and accepts this move only if this move improves the evaluation function.

73. Consider the following game tree in which root is a maximizing node and children are visited left to right. What nodes will be pruned by the alpha-beta pruning ?



- (a) I (b) HI (c) CHI (d) GHI
74. Consider a 3-puzzle where, like in the usual 8-puzzle game, a tile can only move to an adjacent empty space. Given the initial state

1	2
	3

, which of the following state cannot be reached ?

(a)

3	1
	2

(b)

	3
2	1

(c)

1	3
	2

(d)

	2
1	3

75. A software program that infers and manipulates existing knowledge in order to generate new knowledge is known as :
- (a) Data dictionary (b) Reference mechanism
(c) Inference engine (d) Control strategy