

UGC-NET JULY 2018

PAPER WITH SOLUTION
NOV 2017

COMPUTER SCIENCE



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UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-II

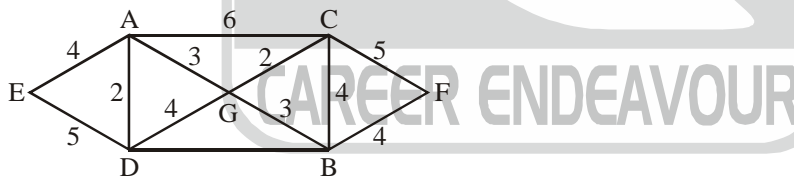
Note: This paper contains **fifty(50)** objective type questions for **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

- If the time is now 4 O' clock, what will be the time after 101 hours from now ?
 (a) 9 O' clock (b) 8 O' clock (c) 5 O' clock (d) 4 O' clock
- Let $m = (313)_4$ and $n = (322)_4$. Find the base 4 expression of $m + n$.
 (a) $(635)_4$ (b) $(32312)_4$ (c) $(21323)_4$ (d) $(1301)_4$

- Let $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$. Find the boolean product $A \odot B$ of the two matrices.

- (a) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

- How many distinguishable permutations of the letters in the word BANANA are there ?
 (a) 720 (b) 120 (c) 60 (d) 360
- Consider the graph given below :



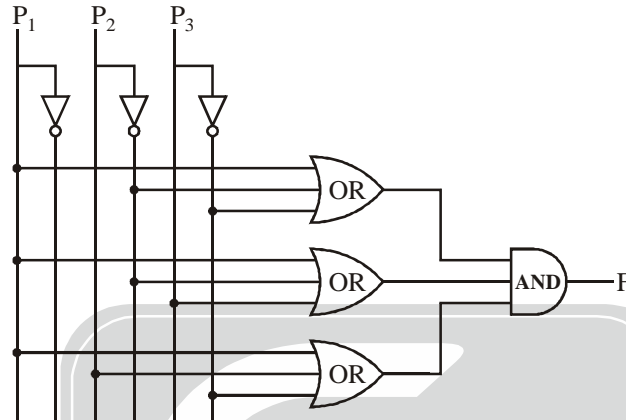
Use Kruskal's algorithm to find a minimal spanning tree for the graph. The list of the edges of the tree in the order in which they are chosen is ?

- The Boolean function with the Karnaugh map

| | | | | | |
|----|----|----|----|----|----|
| | | AB | | | |
| | | 00 | 01 | 11 | 10 |
| CD | 00 | 0 | 1 | 1 | 0 |
| | 01 | 0 | 1 | 1 | 1 |
| | 11 | 1 | 1 | 1 | 1 |
| | 10 | 0 | 1 | 1 | 0 |

- is :
 (a) $(A + C) \cdot D + B$ (b) $(A + B) \cdot C + D$ (c) $(A + D) \cdot C + B$ (d) $(A + C) \cdot B + D$

7. The Octal equivalent of the binary number 1011101011 is
 (a) 7353 (b) 1353 (c) 5651 (d) 5657
8. Let P and Q be two propositions, $\neg(P \leftrightarrow Q)$ is equivalent to :
 (a) $P \leftrightarrow \neg Q$ (b) $\neg P \leftrightarrow Q$ (c) $\neg P \leftrightarrow \neg Q$ (d) $Q \rightarrow P$
9. Negation of the proposition $\exists x H(x)$ is :
 (a) $\exists x \neg H(x)$ (b) $\forall x \neg H(x)$ (c) $\forall x H(x)$ (d) $\neg x H(x)$
10. The output of the following combinational circuit is F :



The value of F is :

- (a) $P_1 + P_2'P_3$ (b) $P_1 + P_2'P_3'$ (c) $P_1 + P_2P_3'$ (d) $P_1' + P_2P_3$
11. 'ptrdata' is a pointer to a data type. The expression *ptrdata++ is evaluated as (in C++) :
 (a) *(ptrdata++) (b) (*ptrdata)++ (c) *(ptrdata)++ (d) depends on compiler
12. The associativity of which of the following operators is Left to Right, in C++ ?
 (a) Unary operator (b) Logical not
 (c) Array element access (d) Addressof
13. A member function can always access the data in , (in C++).
 (a) the class of which it is member (b) the object of which it is a member
 (c) the public part of its class (d) the private part of its class
14. Which of the following is not correct for virtual function in C++ ?
 (a) Must be declared in public section of class
 (b) Virtual function can be static
 (c) Virtual function should be accessed using pointers
 (d) Virtual function is defined in base class
15. Which of the following is not correct (in C++) ?
 (a) Class templates and function templates are instantiated in the same way.
 (b) Class templates differ from function templates in the way they are initiated.
 (c) Class template is initiated by defining an object using the template argument.
 (d) Class template are generally used for storage classes.
16. Which of the following is/are TRUE with reference to 'view' in DBMS ?
 (A) A 'view' is a special stored procedure executed when certain event occurs.
 (B) A 'view' is a virtual table, which occurs after executing a pre-compiled query.
 Code :
 (a) Only (A) is true (b) Only (B) is true
 (c) Both (A) and (B) are true (d) Neither (A) nor (B) are true

17. In SQL, is an Aggregate function.
 (a) SELECT (b) CREATE (c) AVG (d) MODIFY
18. Match the following with respect to RDBMS :
- | | |
|------------------------------|---|
| A. Entity integrity | 1. enforces some specific business rule that do not fall into entity or domain. |
| B. Domain integrity records. | 2. rows can't be deleted which are used by other records. |
| C. Referential integrity | 3. enforces valid entries for a column. |
| D. Userdefined integrity | 4. No duplicate rows in a table. |
- Code :
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 4 | 1 | 2 |
| (b) | 4 | 3 | 2 | 1 |
| (c) | 4 | 2 | 3 | 1 |
| (d) | 2 | 3 | 4 | 1 |
19. In RDBMS, different classes of relations are created using technique to prevent modification anomalies.
 (a) Functional dependencies (b) Data integrity
 (c) Referential integrity (d) Normal forms
20. SQL command changes one or more field in a record.
 (a) LOOK-UP (b) INSERT (c) MODIFY (d) CHANGE
21. Consider an array representation of an n element binary heap where the elements are stored from index 1 to index n of the array. For the element stored at index i of the array ($i \leq n$), the index of the parent is :
 (a) floor $((i + 1)/2)$ (b) ceiling $((i + 1)/2)$ (c) floor $(i/2)$ (d) ceiling $(i/2)$
22. The following numbers are inserted into an empty binary search tree in the given order : 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree ?
 (a) 3 (b) 4 (c) 5 (d) 6
23. Let G be an undirected connected graph with distinct edge weight. Let E_{\max} be the edge with maximum weight and E_{\min} the edge with minimum weight. Which of the following statements is false ?
 (a) Every minimum spanning tree of G must contain E_{\min} .
 (b) If E_{\max} is a minimum spanning tree, then its removal must disconnect G.
 (c) No minimum spanning tree contains E_{\max} .
 (d) G has a unique minimum spanning tree.
24. A list of n strings, each of length n, is sorted into lexicographic order using merge - sort algorithm. The worst case running time of this computation is :
 (a) $O(n \log n)$ (b) $O(n^2 \log n)$ (c) $O(n^2 + \log n)$ (d) $O(n^3)$
25. Postorder traversal of a given binary search tree T produces following sequence of keys :
 3, 5, 7, 9, 4, 17, 16, 20, 18, 15, 14
 Which one of the following sequences of keys can be the result of an in-order traversal of the tree T ?
 (a) 3, 4, 5, 7, 9, 14, 20, 18, 17, 16, 15 (b) 20, 18, 17, 16, 15, 14, 3, 4, 5, 7, 9
 (c) 20, 18, 17, 16, 15, 14, 9, 7, 5, 4, 3 (d) 3, 4, 5, 7, 9, 14, 15, 16, 17, 18, 20

26. Which of the following devices takes data sent from one network device and forward it to the destination node based on MAC address ?
 (a) Hub (b) Modem (c) Switch (d) Gateway
27. do not take their decisions on measurements or estimates of the current traffic and topology.
 (a) Static algorithms (b) Adaptive algorithms
 (c) Non-adaptive algorithms (d) Recursive algorithms
28. The number of bits used for addressing in Gigabit Ethernet is
 (a) 32 bits (b) 48 bits (c) 64 bits (d) 128 bits
29. Which of the following layer of OSI reference model is also called end-to-end layer ?
 (a) Network layer (b) Datalink layer (c) Session layer (d) Transport layer
30. The IP address is used by host when they are being booted.
 (a) 0.0.0.0 (b) 1.0.0.0 (c) 1.1.1.1 (d) 255.255.255.255
31. Consider the following program fragment in assembly language :
- ```

mov ax, 0h
mov cx, 0Ah
doloop :
dec ax
loop doloop

```
- What is the value of ax and cx registers after the completion of the doloop ?  
 (a) ax = FFF5 h and cx = 0 h (b) ax = FFF6 h and cx = 0 h  
 (c) ax = FFF7 h and cx = 0Ah (d) ax = FFF5 h and cx = 0Ah
32. Consider the following assembly program fragment
- ```

stc
mov al, 11010110b
mov cl, 2
rcl al, 3
rol al, 4
shr al, cl
mul cl

```
- The contents of the destination register ax (in hexadecimal) and the status of Carry Flag (CF) after the execution of above instruction, are :
 (a) ax = 003CH; CF = 0 (b) ax = 001EH; CF = 0
 (c) ax = 007BH; CF = 1 (d) ax = 00B7H; CF = 1
33. Which of the following regular expressions, each describing a language of binary numbers (MSB to LSB) that represents non-negative decimal values, does not include even values ?
 (a) $0^*1^*0^*1^*$ (b) $0^*1^*0^+1^*$ (c) $0^*1^*0^*1^+$ (d) $0^+1^*0^*1^*$
34. Which of the following statements is/are TRUE ?
 A. The grammar $S \rightarrow SS|a$ is ambiguous. (Where S is the start symbol)
 B. The grammar $S \rightarrow 0S1|01S|\epsilon$ is ambiguous. (The special symbol ϵ represents the empty string). (Where S is the start symbol)
 C. The grammar (Where S is the start symbol)
 $S \rightarrow T/U$
 $T \rightarrow xSy|xy|\epsilon$

$$U \rightarrow yT$$

generates a languages consisting of the string $yxxy$.

- (a) Only (A) and (B) are true
- (b) Only (A) and (C) are true
- (c) Only (B) and (C) are true
- (d) All of (A), (B) and (C) are true

35. Match the description of several parts of a classic optimizing compiler in List-I, with the names of those parts in List-II :

List-I

- A. A part of a compiler that is responsible for recognizing syntax.
- B. A part of a compiler that takes as input a stream of characters and produces as output a stream of words along with their associated syntactic categories.
- C. A part of a compiler that understand the meanings of variable names and other symbols and check that they are used in ways consistent with their definitions.
- D. An IR-to-IR transformer that tries to improve that IR program in some way (Intermediate Representation).

List-II

- (i) Optimizer
- (ii) Semantic Analysis
- (iii) Parser
- (iv) Scanner

Code :

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

- 36. In distributed system, the capacity of a system to adapt the increased service load is called
 - (a) Tolerance
 - (b) Scalability
 - (c) Capability
 - (d) Loading
- 37. In disk scheduling algorithm, the disk head moves from one end to other end of the disk, serving the request along the way. When the head reaches the other end, it immediately returns to the beginning of the disk without serving any requests on the return trip.
 - (a) LOOK
 - (b) SCAN
 - (c) C-LOOK
 - (d) C-SCAN
- 38. Suppose there are six files F1, F2, F3, F4, F5, F6 with corresponding sizes 150 KB, 225 KB, 75 KB, 60 KB, 275 KB and 65 KB respectively. The files are to be stored on a sequential device in such a way that optimizes access time. In what order should the files be stored ?
 - (a) F5, F2, F1, F3, F6, F4
 - (b) F4, F6, F3, F1, F2, F5
 - (c) F1, F2, F3, F4, F5, F6
 - (d) F6, F5, F4, F3, F2, F1
- 39. Which module gives control of the CPU to the process selected by the short-term scheduler ?
 - (a) Dispatcher
 - (b) Interrupt
 - (c) Scheduler
 - (d) Threading
- 40. Two atomic operations permissible on Semaphores are and
 - (a) wait, stop
 - (b) wait, hold
 - (c) hold, signal
 - (d) wait, signal

41. Software does not wear-out in the traditional sense of the term, but software does tend to deteriorate as it evolves, because :
- (a) Software suffers from exposure to hostile environments.
 - (b) Defects are more likely to arise after software has been used often.
 - (c) Multiple change requests introduce errors in component interactions.
 - (d) Software spare parts become harder to order.
42. Software re-engineering is concerned with :
- (a) Re-constructing the original source code from the existing machine (low-level) code program and modifying it to make it more user - friendly.
 - (b) Scrapping the source code of a software and re-writing it entirely from scratch.
 - (c) Re-organising and modifying existing software system to make them more maintainable.
 - (d) Translating source code of an existing software to a new machine (low-level) language.
43. Which of the following is not a key issue stressed by an agile philosophy of software engineering ?
- (a) The importance of self-organizing teams as well as communication and collaboration between team members and customers.
 - (b) Recognition that change represents opportunity.
 - (c) Emphasis on rapid delivery of software that satisfies the customer.
 - (d) Having a separate testing phase after a build phase.
44. What is the normal order of activities in which traditional software testing is organized ?
(A) Integration testing (B) System testing (C) Unit testing (D) Validation testing
- Codes :**
- (a) (C), (A), (B), (D) (b) (C), (A), (D), (B) (c) (D), (C), (B), (A) (d) (B), (D), (A), (C)
45. Which of the following testing techniques ensures that the software's product runs correctly after the changes during maintenance ?
- (a) Path testing (b) Integration testing (c) Unit testing (d) Regression testing
46. Which of the following Super Computers is the fastest Super Computer ?
- (a) Sun-way TaihuLight (b) Titan
 - (c) Piz Daint (d) Sequoia
47. Which of the following statements about ERP system is true ?
- (a) Most ERP software implementations fully achieve seamless integration.
 - (b) ERP software packages are themselves combinations of separate applications for manufacturing, materials, resource planning, general ledger, human resources, procurement and order entry.
 - (c) Integration of ERP system can be achieved in only one way.
 - (d) An ERP package implemented uniformly throughout an enterprise is likely to contain very flexible connections to allow changes and software variations.
48. Which of the following is not a Clustering method ?
- (a) K-Mean method (b) Self Organizing feature map method
 - (c) K-nearest neighbour method (d) Agglomerative method
49. Which of the given wireless technologies used in IoT, consumes the least amount of power ?
- (a) Zigbee (b) Bluetooth (c) Wi-Fi (d) GSM/CDMA
50. Which speed up could be achieved according to Amdahl's Law for infinite number of processes if 5% of a program is sequential and remaining part is ideally parallel ?
- (a) Infinite (b) 5 (c) 20 (d) 50

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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.

- In 8085 microprocessor which of the following flag(s) is (are) affected by an arithmetic operation?
(a) AC flag only (b) CY flag only (c) Z flag only (d) AC, CY, Z flags
- In 8085 microprocessor the address bus is of _____ bits
(a) 4 (b) 8 (c) 16 (d) 32
- In the architecture of 8085 microprocessor match the following
(A) Processing unit (I) Interrupt
(B) Instruction unit (II) General purpose Register
(C) Storage and Interface unit (III) ALU
(IV) Timing and Control

Code:

| | A | B | C |
|-----|-----|-----|----|
| (a) | IV | I | II |
| (b) | III | IV | II |
| (c) | II | III | I |
| (d) | I | II | IV |

- Which of the following addressing mode is best suited to access elements of an array of contiguous memory locations?
(a) Indexed addressing mode (b) Base register addressing mode
(c) Relative address mode (d) Displacement mode
- Which of the following is CORRECT statement
(a) In memory-mapped I/O, the CPU can manipulate I/O data residing in interface registers that are not used to manipulate memory words
(b) The isolated I/O method isolates memory and I/O addresses so that memory address range is not affected by interface address assignment
(c) In asynchronous serial transfer of data the two units have a common clock
(d) In synchronomous serial transmission data the two units have different clocks
- A micro-instruction format has micro-ops field which is divided into three subfields F1, F2, F3 each having seven distinct micro-operations, condition field CD for four status bits, branch field BR having four options used in conjugation with address field ADF. The address space is is of 128 memory locations. The size of micro-instruction is
(a) 17 bits (b) 20 bits (c) 24 bits (d) 32 bits
- Consider the following four schedules due to three transactions (indicated by the subscript) using read and write on a data item X, denoted by $r(X)$ and $w(X)$ respectively. Which one of them is conflict serializable?

$S_1 : r_1(X); r_2(X); w_1(X); r_3(X); w_2(X)$

$S_2 : r_2(X); r_1(X); w_2(X); r_3(X); w_1(x)$

$S_3 : r_3(X); r_2(X); r_1(X); w_2(X); w_1(X)$

$S_4 : r_2(X); w_2(X); r_3(X); r_1(X); w_1(X)$

- (a) S_1 (b) S_2 (c) S_3 (d) S_4

8. Suppose a database schedule S involves transactions T_1, T_2, \dots, T_n . Consider the precedence graph of S with vertices representing the transactions and edges representing the conflicts. If S is serializable, which one of the following orderings of the vertices of the precedence graph is guaranteed to yield a serial schedule?
- (a) Topological order (b) Depth-first order
(c) Breadth-first order (d) Ascending order of transaction indices
9. If every non-key attribute is functionally dependent on the primary key, then the relation is in
- (a) first normal form (b) second normal form
(c) third normal form (d) fourth normal form
10. Consider a relation $R(A, B, C, D, E, F, G, H)$, where each attribute is atomic, and the following functional dependencies exist.
- $CH \rightarrow G$
 $A \rightarrow BC$
 $B \rightarrow CFH$
 $E \rightarrow A$
 $F \rightarrow EG$
- The relation R is
- (a) in 1NF but not in 3NF (b) in 2NF but not in 3NF
(c) in 3NF but not in BCNF (d) in BCNF
11. Given two relations $R_1(A, B)$ and $R_2(C, D)$, the result of following query
Select distinct A, B
from R_1, R_2
is guaranteed to be same as R_1 provided one of the following condition is satisfied
- (a) R_1 has no duplicates and R_2 is empty
(b) R_1 has no duplicates and R_2 is non-empty
(c) Both R_1 and R_2 have no duplicates
(d) R_2 has no duplicates and R_1 is non-empty
12. Consider a schema $R(A, B, C, D)$ and following functional dependencies
 $A \rightarrow B$
 $B \rightarrow C$
 $C \rightarrow D$
 $D \rightarrow B$
Then decomposition of R into $R_1(A, B)$, $R_2(B, C)$ and $R_3(B, D)$ is
- (a) Dependency preserving and lossless join
(b) Lossless join but not dependency preserving
(c) Dependency perserving but not lossless join
(d) Not dependency preserving and not lossless join
13. Which of the following is not a component of Memory tube display?
- (a) Flooding gun (b) Collector (c) Ground (d) Liquid Crystal
14. Which of the following is not true in case of Oblique Projections?
- (a) Parallel projection rays are not perpendicular to the viewing plane
(b) Parallel lines in space appear parallel on the final projected image
(c) used exclusively for pictorial purposes rather than formal working drawings
(d) Projectors are always perpendicular to the plane of projection

15. With respect to CRT, the horizontal retrace defined as
- The path an electron beam takes when returning to the left side of the CRT
 - The path an electron beam takes when returning to the right side of the CRT
 - The technique of turning the electron beam off while retracing
 - The technique of turning the electron beam on/off while retracing
16. Find the equation of circle $x^2 + y^2 = 1$ in terms of $x' y'$ coordinates, assuming that the xy coordinate system results from a scaling of 3 units in the x' direction and 4 units in the y' direction
- $3(x')^2 + 4(y')^2 = 1$
 - $\left(\frac{x'}{3}\right)^2 + \left(\frac{y'}{4}\right)^2 = 1$
 - $(3x')^2 + (4y')^2 = 1$
 - $\frac{1}{3}(x')^2 + \frac{1}{4}(y')^2 = 1$
17. Find the normalization transformation that maps a window whose lower left corner is at (1, 1) and upper right corner is at (3, 5) onto a viewport that is the entire normalized device screen
- $\begin{pmatrix} \frac{1}{2} & 0 & -\frac{1}{2} \\ 0 & \frac{1}{4} & -\frac{1}{4} \\ 0 & 0 & 1 \end{pmatrix}$
 - $\begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & -\frac{1}{4} & \frac{1}{4} \\ 1 & 1 & 1 \end{pmatrix}$
 - $\begin{pmatrix} \frac{1}{2} & 0 & -\frac{1}{2} \\ 0 & \frac{1}{4} & \frac{1}{4} \\ 1 & 0 & 0 \end{pmatrix}$
 - $\begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & \frac{1}{4} & -\frac{1}{4} \\ 1 & 0 & 0 \end{pmatrix}$
18. The three aspects of Quantization, programmers generally concerned with are
- Coding error, sampling rate and Amplification
 - Sampling rate, coding error and conditioning
 - Sampling rate, aperture time and coding error
 - Aperture time, coding error and strobing
19. The logic of pumping lemma is an example of
- iteration
 - recursion
 - the divide and conquer principle
 - the pigeon - hole principle
20. Heap allocation is required for languages that
- use dynamic scope rules
 - support dynamic data structures
 - support recursion
 - support recursion and dynamic data structures
21. Pumping lemma for regular language is generally used for proving
- whether two given regular expressions are equivalent
 - a given grammar is ambiguous
 - a given grammar is regular
 - a given grammar is not regular
22. Which of the following problems is undecidable?
- To determine if two finite automata are equivalent
 - Membership problem for context free grammar
 - Finiteness problem for finite automata
 - Ambiguity problem for context free grammar
23. Finite state machine can recognize language generated by
- only context free grammar
 - only context sensitive grammar
 - only regular grammar
 - any unambiguous grammar

24. The language $L = \{a^i bc^i \mid i \geq 0\}$ over the alphabet $\{a, b, c\}$ is
 (a) a regular language
 (b) not a deterministic context free language but a context free language
 (c) recursive and is a deterministic context free language
 (d) not recursive
25. Suppose we want to download text documents at the rate of 100 pages per second. Assume that a page consists of an average of 24 lines with 80 characters in each line. What is the required bit rate of the channel?
 (a) 192 kbps (b) 512 kbps (c) 1.248 Mbps (d) 1.536 Mbps
26. Quadrature Amplitude Modulation means changing both
 (a) Frequency and phase of the carrier (b) Frequency and Amplitude of the carrier
 (c) Amplitude and phase of the carrier (d) Amplitude and wavelength of the carrier
27. If a file consisting of 50, 000 characters takes 40 seconds to send, then the data rate is
 (a) 1 kbps (b) 1.25 kbps (c) 2 kbps (d) 10 kbps
28. Match the following
- | List-I | List-II |
|------------------------|-------------------------|
| (A) Data link layer | (I) encryption |
| (B) Network layer | (II) connection control |
| (C) Transport layer | (III) routing |
| (D) Presentation layer | (IV) framing |
- Codes:
- | | A | B | C | D |
|-----|-----|-----|-----|----|
| (a) | IV | III | I | II |
| (b) | III | IV | II | I |
| (c) | IV | II | III | I |
| (d) | IV | III | II | I |
29. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and maximum number of hosts in each subnet?
 (a) 62 subnets and 1022 hosts (b) 64 subnets and 1024 hosts
 (c) 62 subnets and 254 hosts (d) 64 subnets and 256 hosts
30. Which of the following statements are true?
 (I) The fragmentation fields in the base header section of IPv4 have moved to the fragmentation extension header in IPv6
 (II) The authentication extension header is new in IPv6
 (III) The record route option is not implemented in IPv6
 (a) I and II only (b) II and III only (c) I and III only (d) I, II and III
31. Consider a full binary tree with n internal nodes, internal path length i , and external path length e . The internal path length of a full binary tree is the sum, taken over all nodes of the tree, of the depth of each node. Similarly, the external path length is the sum, taken over all leaves of the tree, of the depth of each leaf
 Which of the following is correct for the full binary tree?
 (a) $e = i + n$ (b) $e = i + 2n$ (c) $e = 2i + n$ (d) $e = 2^n + i$

32. You are given a sequence of n elements to sort. The input sequence consists of $\frac{n}{k}$ subsequences, each containing k elements. The elements in a given subsequence are all smaller than the elements in the succeeding subsequence and larger than the elements in the preceding subsequence. Thus, all that is needed to sort the whole sequence of length n is to sort the k elements in each of the $\frac{n}{k}$ subsequences. The lower bound on the number of comparisons needed to solve this variant of the sorting problem is

- (a) $\Omega(n)$ (b) $\Omega\left(\frac{n}{k}\right)$ (c) $\Omega(n \log k)$ (d) $\Omega\left(\frac{n}{k} \log \frac{n}{k}\right)$

33. Consider the recurrence relation :

$$T(n) = 8T\left(\frac{n}{2}\right) + Cn, \text{ if } n > 1$$

$$= b \text{ if } n = 1$$

where b and c are constants

The order of the algorithm corresponding to above recurrence relation is

- (a) n (b) n^2 (c) $n \log n$ (d) n^3

34. Consider the following two sequences

$$X = \langle B, C, D, A, B, C \rangle \text{ and } Y = \langle C, A, D, B, C, B \rangle$$

The length of longest common subsequence of X and Y is

- (a) 5 (b) 3 (c) 4 (d) 2

35. A text is made up of the characters a, b, c, d, e each occurring with the probability 0.11, 0.40, 0.16, 0.09 and 0.24 respectively. The optimal Huffman coding technique will have the average length of

- (a) 2.40 (b) 2.16 (c) 2.26 (d) 2.15

36. An undirected graph $G(V, E)$ contains n ($n > 2$) nodes named v_1, v_2, \dots, v_n . Two nodes v_i and v_j are connected if and only if $0 < |i - j| \leq 2$. Each edge (v_i, v_j) is assigned a weight $i + j$. The cost of the minimum spanning tree of such a graph with 10 nodes is

- (a) 88 (b) 91 (c) 49 (d) 21

37. An XML document that adheres to syntax rules specified by XML 1.0 specification in that it must satisfy both physical and logical structured, is called

- (a) well-formed (b) reasonable (c) valid (d) sophisticated

38. Which of the following statement(s) is/are TRUE regarding Java Servlets?

(A) A Java Servlet is a server-side component that runs on the web server and extends the capabilities of a server

(B) A Servlet can use the user interface classes like AWT or Swing

Code:

- (a) Only (A) is TRUE (b) Only (B) is TRUE
(c) Both (A) and (B) are TRUE (d) Neither (A) nor (B) is TRUE

39. Consider the following HTML table definition:

```
<table border = 1>
    <td colspan = 2> Text A </td>
</tr>
<tr>
    <td> Text B </td>
    <td> Text C </td>
</tr>
<tr>
    <td rowspan = 2> Text D </td>
    <td> Text E </td>
</tr>
<tr>
    <td> Text F </td>
</tr>
</table>
```

The above HTML code would render on screen as

(a)

| | |
|--------|--------|
| Text A | |
| Text B | Text C |
| Text D | Text E |
| Text F | |

(b)

| | |
|--------|--------|
| Text A | Text B |
| Text C | |
| Text D | Text E |
| | Text F |

(c)

| | |
|--------|--------|
| Text A | |
| Text B | Text C |
| Text D | Text E |
| | Text F |

(d)

| | |
|--------|--------|
| Text A | |
| Text B | Text C |
| Text D | Text E |
| Text F | |

40. Which of the following statements is/are TRUE?

- (I) In HTML, character entities are used to incorporate external content into a web page, such as images
- (II) Once a web server returns a cookie to a browser, the cookie will be included in all future requests from the browser to the same server

Code:

- (a) Only (I) is TRUE
- (b) Only (II) is TRUE
- (c) Both (I) and (II) are TRUE
- (d) Neither (I) nor (II) is TRUE

41. Which of the following statements is/are TRUE regarding JAVA?

- (A) Constants that cannot be changed are declared using the 'static' keyword
- (B) A class can only inherit one class but can implement multiple interfaces

Code:

- (a) Only (A) is TRUE
- (b) Only (B) is TRUE
- (c) Both (I) and (II) are TRUE
- (d) Neither (I) nor (II) is TRUE

42. What is the output of the following JAVA program?

```
Class Test
{
    public static void main (String [ ] args)
    {
        Test obj = new Test ( );
    }
}
```

```
obj.start ();  
}  
void start ()  
{  
    String stra = “do”;  
    String strb = method (stra);  
    System.out.print (“.” + stra + strb);  
}  
String method (String data)  
{  
    stra = stra + “good”;  
    System.out.print (stra);  
    return “good”;  
}  
}
```

- (a) dogood : dogoodgood (b) dogood : gooddogood
(c) dogood : dodogood (d) dogood : dogood
43. Statistical software quality assurance in software engineering involves
(a) using sampling in place of exhaustive testing of software
(b) surveying customers to find out their opinions about product quality
(c) tracing each defect to its underlying cause, isolating the vital few causes, and moving to correct them.
(d) tracing each defect to its underlying causes, and using the Pareto principle to correct each problem found.
44. Which of the following statements is/are FALSE with respect to software testing?
S1 : White-box tests are based on specifications; better at telling whether program meets specification, better at finding errors of omission
S2 : Black-box tests are based on code; better for finding crashes, out of bounds errors, file not closed errors
S3 : Alpha testing is conducted at the developers site by a team of highly skilled testers for software that is developed as a product to be used by many customers.
(a) only S1 and S2 are FALSE (b) only S1 and S3 are FALSE
(c) only S2 and S3 are FALSE (d) All of S1, S2 and S3 are FALSE
45. A signal processor software is expected to operate for 91.25 days after repair, and the mean software repair time is expected to be 5 minutes. Then, the availability of the software is
(a) 96.9862 % (b) 97.9862% (c) 98.9962% (d) 99.9962%
46. Consider the method mcq ():
int mcq (boolean a, boolean b, boolean c, boolean d)
{
 int ans = 1;
 if (a) {ans = 2; }
 else if (b) {ans = 3;}
 else if (c) {
 if (d) {ans = 4;}
 }
 return ans;
}

If

M1 = Number of tests to exhaustively test mcq ();

M2 = Minimum number of tests to achieve full statement coverage for mcq (); and

M3 = Minimum number of tests to achieve full branch coverage for mcq ();

then (M1, M2, M3) =

(a) (16, 3, 5) (b) (8, 5, 3) (c) (8, 3, 5) (d) (16, 4, 4)

47. A simple stand - alone software utility is to be developed in 'C' programming by a team of software experts for a computer running Linux and the overall size of this software is estimated to be 20, 000 lines of code. Considering (a, b) = (2.4, 1.05) as multiplicative and exponention factor for the basic COCOMO effort estimation equation and (c, d) = (2.5, 0.38) as multiplicative and exponention factor for the basic COCOMO development time estimation equation, approximately how long does the software project take to complete?

(a) 10.52 months (b) 11.52 months (c) 12.52 months (d) 14.52 months

48. In software Configuration Management (SCM), which of the following is a use-case supported by standard version control systems?

(I) Managing several versions or releases of a software

(II) Filing bug reports and tracking their progress

(III) Allowing team members to work in parallel

(IV) Identifying when and where a regression occurred

Code:

(a) Only (I), (III) and (IV)

(b) Only (I), (II) and (III)

(c) Only (I), (II) and (IV)

(d) Only (II), (III) and (IV)

49. Consider the following four processes with the arrival time and length of CPU burst given in milli-seconds:

| Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1 | 0 | 8 |
| P2 | 1 | 4 |
| P3 | 2 | 9 |
| P4 | 3 | 5 |

The average waiting time or preemptive SJF scheduling algorithm is

(a) 6.5 ms (b) 7.5 ms (c) 6.75 ms (d) 7.75 ms

50. Consider a virtual page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Suppose a demand virtual memory system running on a computer system such that the main memory has 3 page frames. Then _____page replacement algorithm has minimum number of page faults

(a) FIFO (b) LIFO (c) LRU (d) Optimal

51. User level threads are threads that are visible to the programmer and are unknown to the kernel. The operating system kernel supports and manages kernel level threads. Three different types of models relate user and kernel level threads

Which of the following statements is/are true?

(A) (i) The many-to-one model maps many user threads to one kernel thread

(ii) The one-to-one model maps one user thread to one kernel thread

(iii) The many-to-many model maps many user threads to smaller or equal kernel threads

(B) (i) Many-to-one model maps many kernel threads to one user thread

(ii) One-to-one model maps one kernel thread to one user thread

(iii) Many-to-many model maps many kernel threads to smaller or equal user threads

Code :

(a) (A) is true ; (B) is false

(b) (A) is false; (B) is false

(c) both (A) and (B) are true

(d) both (A) and (B) are false

52. Consider a system with five processes P_0 through P_4 and three resource types A, B and C. Resource type A has seven instances, resource type B has two instances and resource type C has six instances suppose at time T_0 we have the following allocation.

| Process | Allocation | | | Request | | | Available | | |
|---------|------------|---|---|---------|---|---|-----------|---|---|
| | A | B | C | A | B | C | A | B | C |
| P_0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| P_1 | 2 | 0 | 0 | 2 | 0 | 2 | | | |
| P_2 | 3 | 0 | 3 | 0 | 0 | 0 | | | |
| P_3 | 2 | 1 | 1 | 1 | 0 | 0 | | | |
| P_4 | 0 | 2 | 2 | 0 | 0 | 2 | | | |

If we implement Deadlock detection algorithm we claim that system is _____

- (a) Semaphore (b) Deadlock state (c) Circular wait (d) Not in deadlock state
53. Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. Suppose SSTF disk scheduling algorithm implemented to meet the requests then the total number of head movements are _____ if the disk head is initially at 53.
 (a) 224 (b) 248 (c) 236 (d) 240
54. The bounded buffer problem is also known as
 (a) producer-consumer problem (b) Reader-writer problem
 (c) Dining Philosophers problem (d) Both (b) and (c)
55. In Artificial Intelligence (AI), which agent deals with happy and unhappy state?
 (a) Simple reflex agent (b) Model based agent
 (c) Learning agent (d) Utility based agent
56. If b is the branching factor and m is the maximum depth of the search tree, what is the space complexity of greedy search?
 (a) $O(b + m)$ (b) $O(bm)$ (c) $O(b^m)$ (d) $O(m^b)$
57. Let P, Q, R and S be Propositions. Assume that the equivalence $P \Leftrightarrow (Q \vee \neg Q)$ and $Q \Leftrightarrow R$ hold. Then the truth value of the formula $(P \wedge Q) \Rightarrow ((P \wedge R) \vee S)$ is always
 (a) True (b) False
 (c) Same as truth table of Q (d) Same as truth table of S
58. "If X , then Y unless Z " is represented by which of the following formula in propositional logic?
 (a) $(X \wedge Y) \rightarrow \neg Z$ (b) $(X \wedge \neg Z) \rightarrow Y$
 (c) $X \rightarrow (Y \wedge \neg Z)$ (d) $Y \rightarrow (X \wedge \neg Z)$
59. Consider the following two well-formed formula in propositional logic

$$F1: P \Rightarrow \neg P$$

$$F2: (P \Rightarrow \neg P) \vee (\neg P \Rightarrow P)$$
 Which of the following statements is correct?
 (a) F1 is satisfiable, F2 is valid (b) F1 is unsatisfiable, F2 is satisfiable
 (c) F1 is unsatisfiable, F2 is valid (d) F1 and F2 both are satisfiable
60. Standard planning algorithms assume environment to be
 (a) Both deterministic and fully observable (b) Neither deterministic nor fully observable
 (c) Deterministic but not fully observable (d) Not deterministic but fully observable

61. Which of the following statements is not correct?
 (a) Every recursive language is recursively enumerable
 (b) $L = \{0^n 1^n 0^n \mid n = 1, 2, 3, \dots\}$ is recursively enumerable
 (c) Recursive languages are closed under interaction
 (d) Recursive languages are not closed under intersection
62. Context free grammar is not closed under
 (a) Concatenation (b) Complementation (c) Kleene Star (d) Union
63. Consider the following languages:

$$L_1 = \{a^m b^n \mid m \neq n\}; L_2 = \{a^m b^n \mid m = 2n + 1\}; L_3 = \{a^m b^n \mid m \neq 2n\}$$

Which one of the following statement is correct?

- (a) Only L_1 and L_2 are context free languages (b) Only L_1 and L_3 are context free languages
 (c) Only L_2 and L_3 are context free languages (d) L_1, L_2 and L_3 are context free languages
64. A 4×4 DFT matrix is given by

$$\frac{1}{2} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & x & -1 & y \\ 1 & -1 & 1 & -1 \\ 1 & -j & -1 & j \end{bmatrix} \quad (j^2 = -1)$$

where values of x and y are _____, _____ respectively.

- (a) 1, -1 (b) -1, 1 (c) -j, j (d) j, -j
65. Entropy of a discrete random variable with possible values $\{x_1, x_2, \dots, x_n\}$ and probability density function $P(x)$ is

$$H(X) = -\sum_{i=1}^n P(x_i) \log_b P(x_i)$$

The value of b gives the units of entropy. The unit for $b = 10$ is

- (a) bits (b) bann (c) nats (d) deca

66. For any binary (n, h) linear code with minimum distance $(2t + 1)$ or greater $n - h \geq \log_2 \left[\sum_{i=0}^{\alpha} \binom{n}{i} \right]$
 where α is
 (a) $2t + 1$ (b) $t + 1$ (c) $t - 1$ (d) t

67. Which of the following is a valid reason for causing degeneracy in a transportation problem? Here m is number of rows and n is number of columns in transportation table
 (a) When the number of allocations is $m + n - 1$
 (b) When two or more occupied cells become unoccupied simultaneously
 (c) When the number of allocations is less than $m + n - 1$
 (d) When a loop cannot be drawn without using unoccupied cells, except the starting cell of the loop

68. Consider the following LPP

$$\text{Max } Z = 15x_1 + 10x_2$$

Subject to the constraints

$$4x_1 + 6x_2 \leq 360$$

$$3x_1 + 0x_2 \leq 180$$

$$0x_1 + 5x_2 \leq 200$$

$$x_1, x_2 \geq 0$$

The solution of the LPP using Graphical solution technique is

(a) $x_1 = 60, x_2 = 0$ and $Z = 900$

(b) $x_1 = 60, x_2 = 20$ and $Z = 1100$

(c) $x_1 = 60, x_2 = 30$ and $Z = 1200$

(d) $x_1 = 50, x_2 = 40$ and $Z = 1150$

69. Consider the following LPP:

$$\text{Min } Z = 2x_1 + x_2 + 3x_3$$

Subject to :

$$x_1 - 2x_2 + x_3 \geq 4$$

$$2x_1 + x_2 + x_3 \leq 8$$

$$x_1 - x_3 \geq 0$$

$$x_1, x_2, x_3 \geq 0$$

The solution of this LPP using Dual Simplex Method is

(a) $x_1 = 0, x_2 = 0, x_3 = 3$ and $Z = 9$

(b) $x_1 = 0, x_2 = 6, x_3 = 0$ and $Z = 6$

(c) $x_1 = 4, x_2 = 0, x_3 = 0$ and $Z = 8$

(d) $x_1 = 2, x_2 = 0, x_3 = 2$ and $Z = 10$

70. Consider a Takagi-Sugeno-Kang (TSK) Model consisting of rules of the form:

If x_1 is A_{i1} and and x_r is A_{ir}

THEN $y = f_i(x_1, x_2, \dots, x_r) = b_{i0} + b_{i1}x_1 + \dots + b_{ir}x_r$

assume, α_i is the matching degree of rule i , then the total output of the model is given by

(a) $y = \sum_{i=1}^L \alpha_i f_i(x_1, x_2, \dots, x_r)$

(b) $y = \frac{\sum_{i=1}^L \alpha_i f_i(x_1, x_2, \dots, x_r)}{\sum_{i=1}^L \alpha_i}$

(c) $y = \frac{\sum_{i=1}^L f_i(x_1, x_2, \dots, x_r)}{\sum_{i=1}^L \alpha_i}$

(d) $y = \max_i [\alpha_i f_i(x_1, x_2, \dots, x_r)]$

71. Consider a single perceptron with sign activation function. The perceptron is represented weight vector $[0.4 - 0.3 \ 0.1]'$ and a bias $\theta = 0$. If the input vector to the perceptron is $X = [0.2 \ 0.6 \ 0.5]$ then the output of the perceptron is :

(a) 1

(b) 0

(c) -0.05

(d) -3

72. The Sigmoid activation function $f(t)$ is defined as

- (a) $\frac{1}{\exp(t) + \exp(-t)}$ (b) $t \exp(-t)$ (c) $\frac{1}{1 + \exp(t)}$ (d) $\frac{1}{1 + \exp(-t)}$

73. Consider the following statements

(A) UNIX provides three types of permissions

- * Read
- * Write
- * Execute

(B) UNIX provides three sets of permissions

- * permission for owner
- * permission for group
- * permission for others

Which of the above statement/s is/are true?

- (a) Only (A) (b) Only (B) (c) Both (A) and (B) (d) Neither (A) nor (B)

74. Which of the following routing technique / techniques is/ are used in distributed systems?

(I) Fixed Routing (II) Virtual Routing (III) Dynamic Routing

Code:

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

75. Match the following WINDOWS system calls and UNIX system calls with reference to process control and File manipulation

WINDOWS

- (A) Create-process ()
 (B) WaitForSingleObject ()
 (C) CreateFile ()
 (D) CloseHandle ()

UNIX

- (I) Open ()
 (II) Close ()
 (III) Fork ()
 (IV) Wait ()

Codes :

- | | A | B | C | D |
|-----|----------|----------|----------|----------|
| (a) | III | IV | I | II |
| (b) | IV | III | I | II |
| (c) | IV | III | II | I |
| (d) | III | IV | II | I |

SOLVED PAPER : NOV. 2017

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-II

1. After every 24 hours time will be same as now.

So, $101 \div 4 = 5$

Now time is 4, so after 101 hours

Time will be $(4 + 5) = 9$

Correct option is (a)

$$\begin{array}{r}
 (313)_4 \\
 + (322)_4 \\
 \hline
 (1301)_4
 \end{array}
 \text{ or}$$

$$(313)_4 = (110111)_2$$

$$(322)_4 = (111010)_2$$

$$\begin{array}{r}
 110111 \\
 +111010 \\
 \hline
 (1110001)_2
 \end{array}$$

$$\begin{array}{ccccccc}
 \boxed{0} & \boxed{1} & \boxed{1} & \boxed{1} & \boxed{0} & \boxed{0} & \boxed{0} & \boxed{1} \\
 \hline
 & & & & & & & \rightarrow (1301)_4
 \end{array}$$

Correct option is (d)

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$$

Do the matrix multiplication

Correct option is (a)

4. Number of permutations of the word BANANA are

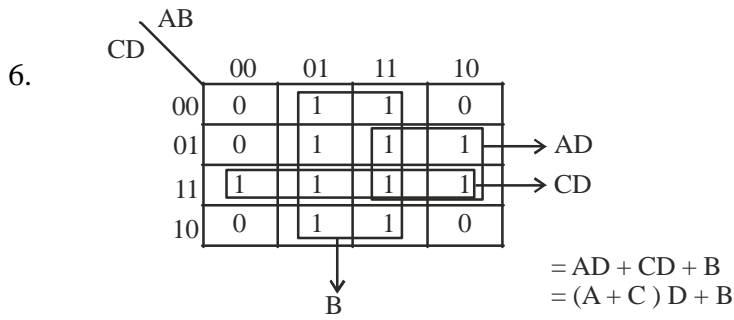
$$B \rightarrow 1 \Rightarrow \frac{(2+3+1)!}{2! * 3!}$$

$$A \rightarrow 3 = \frac{6!}{2! * 3!} \Rightarrow 60$$

$$N \rightarrow 2$$

Correct option is (c)

5. Weight of edge DB is missing so question is not complete to give the correct answer. If weight of DB is less than 2 then it is part of every MST.



Correct option is (a)

7. $(1011101011)_2 = (?)_8$

Make grouping of 3 binary digits to convert the binary number into its octal equivalent.
(Note : Grouping from right to left)

$$\underbrace{001}_1 \quad \underbrace{011}_3 \quad \underbrace{101}_5 \quad \underbrace{011}_3 = (1353)_8$$

Correct option is (b)

8.

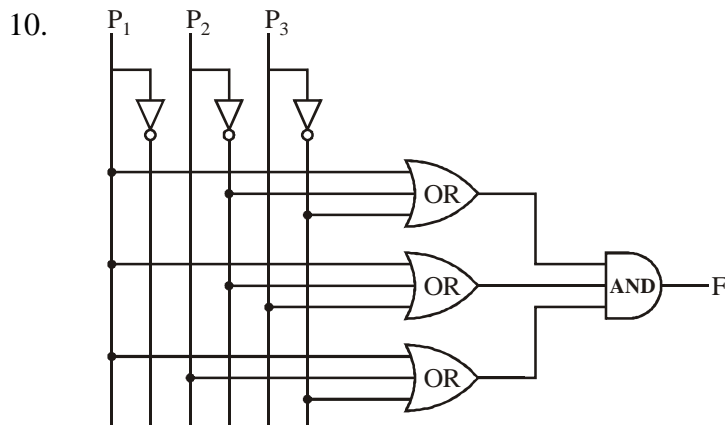
| P | ¬P | Q | ¬Q | P ↔ Q | P ↔ ¬Q | ¬P ↔ Q | ¬(P ↔ Q) |
|---|----|---|----|-------|--------|--------|----------|
| T | F | T | F | T | F | F | F |
| T | F | F | T | F | T | T | T |
| F | T | T | F | F | T | T | T |
| F | T | F | T | T | F | F | F |

$$\neg(P \leftrightarrow Q) \equiv (P \leftrightarrow \neg Q) \equiv \neg P \leftrightarrow Q$$

Correct options are (a) and (b)

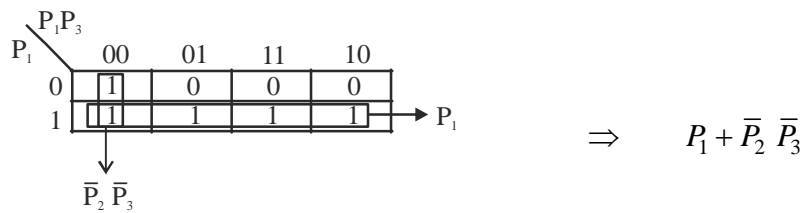
9. $\neg(\exists x H(x)) \equiv \forall x \neg H(x)$

Correct option is (b)



$$F = (P_1 + \bar{P}_2 + \bar{P}_3) \cdot (P_1 + \bar{P}_2 + P_3) \cdot (P_1 + P_2 + \bar{P}_3)$$

Put this Pos into k.map and minimize it to get the correct answer.



Correct option is (b)

11. * & ++ both the unary operator's. Precedence of both the operator's are same. But unary operator's are right associative. So, they must be solved from right to left.

So, ptrdata++ is evaluate as *(ptrdata++)

Correct option is (a)

12. Unary operator's and address of operator is having right associating. So, they are solved from right to left. Whereas array element access are done from left to right.

Correct option is (c)

13. A member function can always access the data in the class of which it is member.

Correct option is (a)

14. Rules of virtual function:

- (1) Virtual function must be member of some class
- (2) They can't be static member of a class
- (3) They are accessed by using object pointers
- (4) They can be friend of another class

So, according to the above rules option (b) is the most incorrect statement about virtual function

Correct option is (b)

15. (I) Class templates and function templates are instantiated in the same way \rightarrow TRUE

(II) Class templates differ from function templates in the way they are initiated \rightarrow FALSE

(III) Class template is initiated by defining an object using the template argument \rightarrow TRUE

(IV) Class template are generally used for storage classes \rightarrow TRUE

Correct option is (b)

16. View is a virtual table, through which a selective portion of data from one or more tables can be seen. A view does not contain data of its own.

Correct option is (b)

17. AVG is an aggregate function which calculate the average.

Select, CREATE and MODIFY are not the Aggregate function in SQL

Correct option is (c)

18. Entity integrity says that there must be a super key in each relation. So, that no two duplicate row's can occur in a table.

$$a \rightarrow (iv)$$

- Domain integrity says that all the values within a column must lie within the domain of that column

$$b \rightarrow (iii)$$

- Referential integrity deals with the foreign key where we can't delete a row which are used by other records.

$$c \rightarrow (ii)$$

$$d \rightarrow (i)$$

Correct option is (b)

19. Normal form's are the techniques which are used to prevent anomalies from a RDBMS. Anomalies which can be prevented by normal form techniques are

- (1) Insertion Anomalies
- (2) Deletion Anomalies
- (3) Updation Anomalies

Correct option is (d)

20. By using 'MODIFY' we can change one or more fields in a record

Syntax:

ALTER TABLE <table_name>

MODIFY <Column_name> <column_type>

Correct option is (c)

21. If a binary heap with n element is represented by an array with size n then

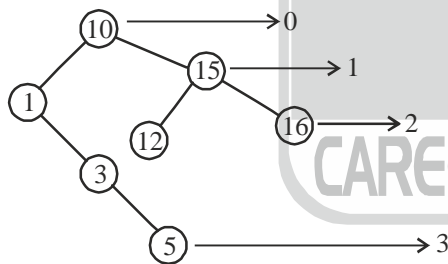
The index of parent of an element stored at index, $i = \left\lfloor \frac{i}{2} \right\rfloor$

The index of left child of an element stored at index $i = 2i$

The index of right child of an element stored at index $i = 2i + 1$

Correct option is (c)

22. The BST after the insertion of all the following keys
10, 1, 3, 5, 15, 12, 16



The height of the tree is 3

Correct option is (a)

23. Since the graph G has distinct edge weight then E_{min} is the part of every MST so (1) is true
If E_{max} is part of MST then E_{max} is a bridge and its removal disconnect the graph so (2) is true
If E_{max} is a bridge then it is always is a part of every MST regardless of its weight hence (3) is false
As the graph G has distinct edge weight then it has a unique MST.

Correct option is (c)

24. Since, we have a list of n string each of length n, total number of characters = n^2
Time taken to sort them in lexicographic order = $n^2 \log n^2 = 2n^2 \log n = O(n^2 \log n)$

Correct option is (b)

25. When BST is traversed in INORDER then it gives an ascending order of keys

Correct option is (d)

26. • HUB and Modem are physical layer device which can't get MAC address from DLL header
 • Switch is a DLL device which forward the packet by looking at MAC addresses present in DLL header

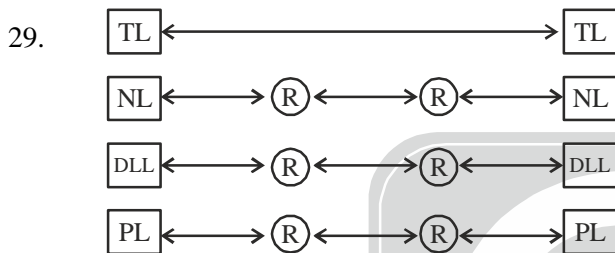
Correct option is (c)

27. Algorithm which take their decisions on measurements or estimates of the current traffic and topology is known as adaptive algo.
 Algorithm which do not take their decisions on measurements or estimates of the current traffic and topology is known as non-adaptive algorithms.

Correct option is (c)

28. Ethernet use the MAC addresses for addressing. Every version of MAC address is of length 48 bits.

Correct option is (b)



Transport layer is responsible for the end to end communication. So, it is also known as end to end layer

Correct option is (d)

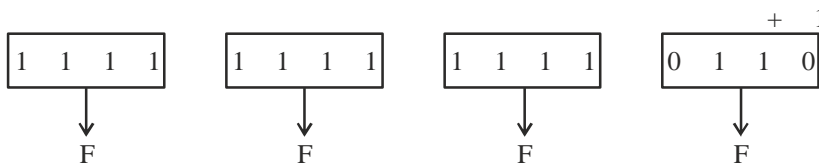
30. DHCP client address is 0.0.0.0. When any host is initially booted then it do not have its own IP address. So, at that time to get the IP he send a DHCP request by using source address 0.0.0.0

Correct option is (a)

31. Each time when loop is executed value of ax is decremented by 1 and value of CX is also decremented by 1. Loop will be executed untill value of cx become 0. Value of CX is 10, so loop will be executed 10 times and value of ax will be decremented 10 times From (0) the value of AX become (-10)

10 is 0000 0000 0000 1010

-10 is 1111 1111 1111 0101



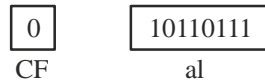
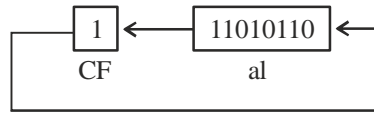
ax = F F F 6 h

CX = 0 h

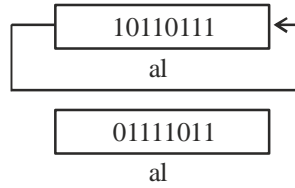
Correct option is (b)

32. stc CF 1
 mov al, 11010110 al 11010110
 mov Cl, 2 Cl 2

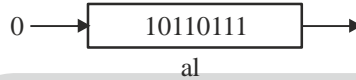
rcl al, 3
 (rotate al left
 through carry
 by 3 bit)



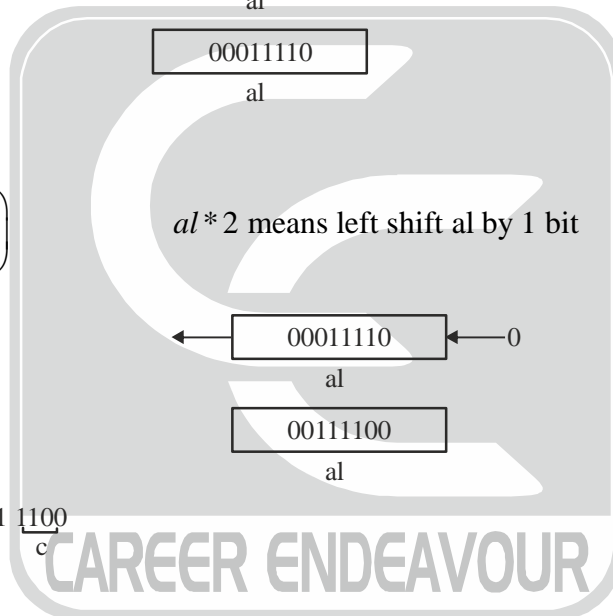
rol al, 4
 (rotate al left
 by 4 bit)



shr al, Cl
 (shift al right
 by Cl # bits)



mul Cl
 (multiply Cl with al &
 result is stored in al)



Finally content of al = $\frac{0011}{3} \frac{1100}{c}$

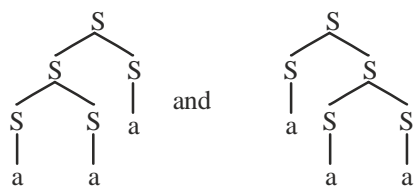
CF = 0

Correct option is (a)

33. Option (a) generates 10 which is 2, a decimal even number
 Option (b), generates 10 which is 2, a decimal even number
 Option (c) generates 010 which is 2, a decimal even number
 Option (d) generates a binary number whose last bit is always 1, hence it produces binary numbers whose decimal value does not include even values.

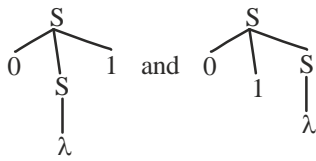
Correct option is (c)

34. For grammar $S \rightarrow SS / a$ and $\omega = aaa$



$S \rightarrow SS / a$ ambiguous

Grammar $S \rightarrow 0S1 / 01S \mid \lambda$ and $\omega = a1$



Grammar $S \rightarrow 0S1 / 01S / \lambda$ is ambiguous

For the grammar,

$$S \rightarrow T / U$$

$$T \rightarrow xS_y / xy \mid \lambda$$

$$U \rightarrow yT$$

$$S \rightarrow U \rightarrow yT \rightarrow yxS_y \rightarrow yx xS_{yy} \rightarrow yxxyy$$

All the given statements (a), (b) and (c) are correct

Correct option is (d)

35. **Scanner:** It takes the whole program and decomposes it into pieces called token

Parser : Checks the syntax of program

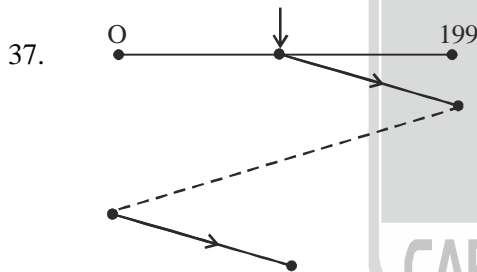
Symantic Analysis : Responsible to check the meaning of variables name and their consistent use as per their definitions

Optimizer : It improves the intermediate code by applying optimizing techniques

Correct option is (a)

36. The capacity of distributed system to adapt the increased service load is called scalability.

Correct option is (b)



From current position head move in one direction and after reaching at end head move's in reverse direction and without servicing any request head moves in begning. From begining head start fulfilling requests in same direction again.

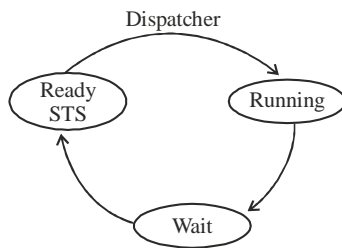
Above pattern comes under C-SCAN disk scheduling algorithm

Correct option is (d)

38. To optimize the access time we must store them in ascending order of their sizes on sequential device.

| | | | | | |
|-----|-----|-----|------|------|------|
| 60K | 65K | 75K | 150K | 225K | 275K |
| F4 | F6 | F3 | F1 | F2 | F5 |

Correct option is (b)



39. Short term scheduler select a job to execute next. Then the control of CPU to the process selected by STS is given by dispatcher. Dispatcher is responsible for context switching.
Correct option is (a)
40. Wait and signal are the two possible operations that we can apply on semaphore variables. Wait decrease the value of semaphore variable by 1 and signal increase the value of semaphore variable by 1.
Correct option is (d)
41. Software does not wear-out in the traditional sense of the term, but software does tend to deteriorate as it evolves, because multiple change requests introduce errors in component interactions.
Correct option is (c)
42. Reengineering modify the existing software for drastic changes to make it more maintainable with new technology and changed demands.
Correct option is (c)
43. Having separate build and testing phase is not any special feature of agile philosophy. Agile most concentrate development.
Correct option is (d)
44. Unit testing → Integration testing → System testing → Validation testing
 These are normal order of activities in which traditional software testing is organized
Correct option is (a)
45. Any testing done on the software after in the maintenance phase is called Regression testing.
Correct option is (d)
46. Sunway Taihulight has been named as the world's fastest supercomputer title, as per recently released semiannual Top 500 list of supercomputers. It is developed by the China's National Research Centre of Parallel Computer Engineering and Technology (NRCPC). Taihulight can perform 93 quadrillions calculations per second (petaflop/s). It is intended for use in research and engineering including climate, weather, life sciences, advanced manufacturing and data analytics. The TOP 500 list is considered one of the most authoritative rankings of the world's supercomputers. It is compiled on the basis of the machines' performance on the Linpack benchmark by experts from U.S. and Germany.
Correct option is (a)
47. (I) Most ERP software implementations fully achieve seamless integration → false
 (II) Some ERP software packages are themselves combinations of separate applications for manufacturing, materials resource planning, general ledger, human resources, procurement, and order entry → true.
 (c) Integration of ERP systems can be achieved in only one way → false
 (d) A specific enterprise software package implemented uniformly throughout an enterprise is likely to contain very flexible connections to allow changes and software variations → false
Correct option is (b)

48. Agglomerative Method This approach is also known as the bottom-up approach. In this, we start with each object forming a separate group. It keeps on merging the objects or groups that are close to one another. It keep on doing so until all of the groups are merged into one or until the termination condition holds.

K-means (MacQueen, 1967) is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early groupage is done. At this point we need to re-calculate k new centroids as barycenters of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. In other words centroids do not move any more. Finally, this algorithm aims at minimizing an objective function, in this case a squared error function.

Self-organizing feature maps (SOFM) learn to classify input vectors according to how they are grouped in the input space. They differ from competitive layers in that neighboring neurons in the self-organizing map learn to recognize neighboring sections of the input space. Thus, self-organizing maps learn both the distribution (as do competitive layers) and topology of the input vectors they are trained on. The neurons in the layer of an SOFM are arranged originally in physical positions according to a topology function

K-Nearest Neighbours is one of the most basic yet essential classification algorithms in Machine Learning. It belongs to the supervised learning domain and finds intense application in pattern recognition, data mining and intrusion detection. It is widely disposable in real-life scenarios since it is non-parametric, meaning, it does not make any underlying assumptions about the distribution of data (as opposed to other algorithms such as GMM, which assume a Gaussian distribution of the given data). We are given some prior data (also called training data), which classifies coordinates into groups identified by an attribute.

Therefore K-Nearest Neighbours is not clustering method.

Correct option is (c)

49. ZigBee, like Bluetooth, has a large installed base of operation, although perhaps traditionally more in industrial settings. ZigBee PRO and ZigBee Remote Control (RF4CE), among other available ZigBee profiles, are based on the IEEE802.15.4 protocol, which is an industry-standard wireless networking technology operating at 2.4GHz targeting applications that require relatively infrequent data exchanges at low data-rates over a restricted area and within a 100m range such as in a home or building.

ZigBee/RF4CE has some significant advantages in complex systems offering low-power operation, high security, robustness and high scalability with high node counts and is well positioned to take advantage of wireless control and sensor networks in M2M and IoT applications. The latest version of ZigBee is the recently launched 3.0, which is essentially the unification of the various ZigBee wireless standards into a single standard. An example product and kit for ZigBee development are TI's CC2538SF53RTQT ZigBee System-On-Chip IC and CC2538 ZigBee Development Kit.

- Standard: ZigBee 3.0 based on IEEE802.15.4

- Frequency: 2.4GHz
- Range: 10-100m
- Data Rates: 250kbps

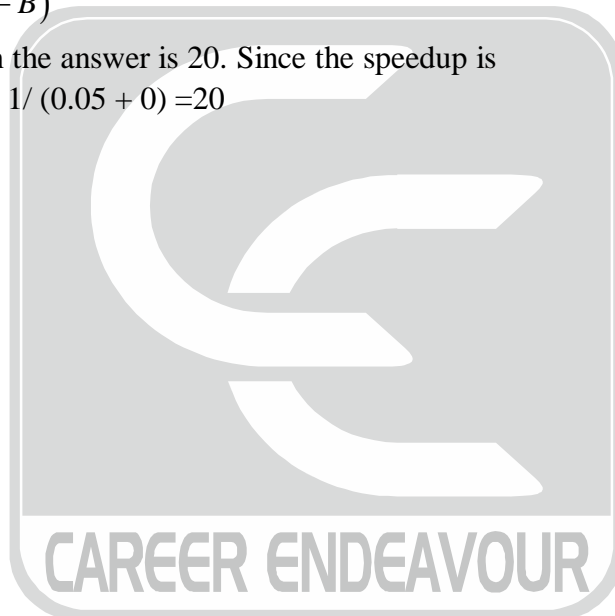
Correct option is (b)

50. Which speedup could be achieved according to Amdahl's law if an "infinite number" of processors is available but 5% of a program is sequential and the remaining part is ideally parallel? To explore speedup more, we shall do a bit of analysis. If there are N workers working on a project, we may assume that they would be able to do a job in $1/N$ time of one worker working alone. Now, if we assume the strictly serial part of the program is performed in $B * T(1)$ time, then the strictly parallel part is performed in $((1-B) * T(1)) / N$ time. With some substitution and number manipulation, we get the formula for speedup as:

$$S = \frac{N}{(B * N) + (1 - B)}$$

By using above equation the answer is 20. Since the speedup is $S = 1 / (0.05 + 0.95 / \infty) = 1 / (0.05 + 0) = 20$

Correct option is (c)



PAPER-III

- In 8085 the flags which can be affected by an arithmetic operation are
 (a) AC – Auxulory carry flag (b) Z – Zero flag
 (c) CY – Carry flag (d) S – sign flag (e) V – overflow flag

Correct option is (d)

- In 8085 up the address bus is of 16 bits and we can generate $(2)^{16}$ different address by using the 16 bit address bus.

Correct option is (c)

- ALU (Arithmetic and Logic Unit) is the processing unit of CPU which can perform arithmetical and logical operations

$$a \rightarrow (iii)$$

General purpose register's are the storage unit of processor, where CPU can store either address OR data

$$c \rightarrow (ii)$$

Timing and control unit generate the timing control signals to perform various instruction

$$b \rightarrow (iv)$$

Correct option is (b)

- Index addressing mode is used for accessing the array elements which are stored at contiguous memory locations. In this mode the base address of array is specified in instruction and we can access the consicutive elements just by changing the value of index register.
 Effective address = Index register vlaue + Address specified in instruction

Correct option is (a)

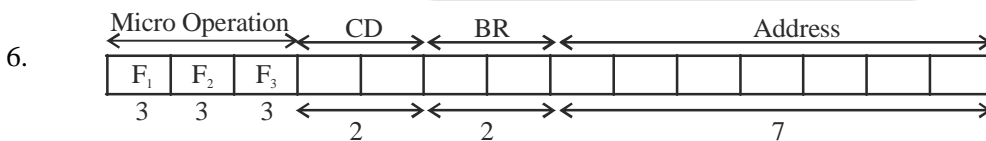
- In memory mapped I/O we divide the memory addresses into two parts. One is to address I/O devices and one for the memory address.

In isolated I/O we use different opcode for I/O and memory and addresses will be same so that address range is not effected by interface address assignment.

In synchronous serial transfer two units having same clock and in asynchronous serial transfer two communicating units is having different clock.

The only correct statement is (b)

Correct option is (b)



If number of operations = 7

$$\text{OPCODE length} = \lceil \log_2 7 \rceil = 3 \text{ bits}$$

Number of memory locations = 128

$$\text{Address length} = \lceil \log_2 128 \rceil = 7 \text{ bits}$$

Number of options in branch = 4

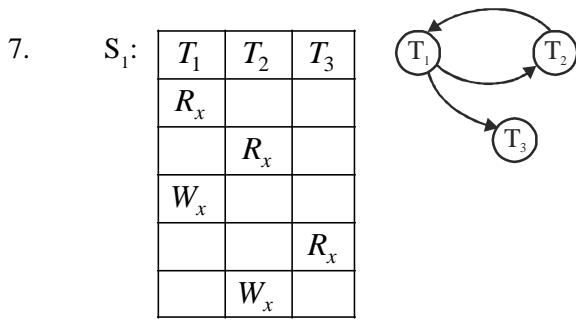
$$\text{Bit required} = \log_2 4 = 2 \text{ bits}$$

Number conditional flags = 4

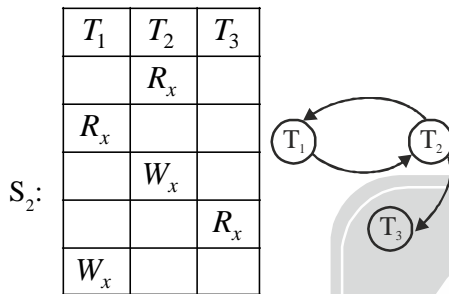
Number of bits required = 2 bits

$$3 + 3 + 3 + 2 + 2 + 7 = 20 \text{ bits}$$

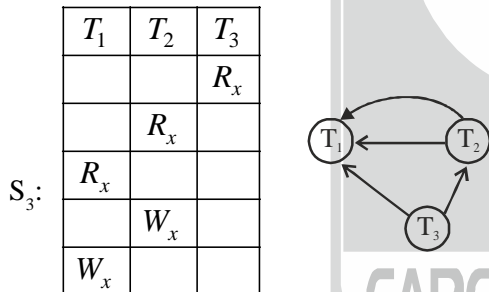
Correct option is (b)



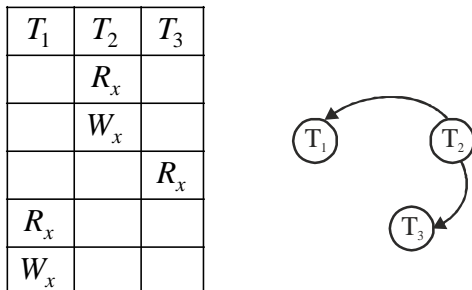
S_1 is not conflict serializable because dependency graph of S_1 contains cycle.



S_2 is not conflict serializable because dependency graph of S_2 contains cycle.



S_3 is not conflict serializable because dependency graph of S_3 contains cycle.



S_4 is conflict serializable.

Correct option is (d)

8. After designing the precedence graph if the schedule is serializable. Then topological ordering of the vertices gives the order of transaction in which they are completed. Its request for a particular resource

Correct option is (a)

9. If any non-key attribute devices any other non key attribute then relation is not in third normal form

$$Nk \rightarrow Nk$$

and if every non-key attribute is determined by a primary key then $Nk \rightarrow Nk$ is not present in any case and the relation must be in 3rd normal form.

Correct option is (c)

10. $CH \rightarrow G$

$$A \rightarrow BC$$

$$B \rightarrow CFH$$

$$E \rightarrow A$$

$$F \rightarrow EG$$

here D is not at RHS of any dependency hence D must be part of every primary key.

$$(AD)^+ = \{A, D, B, C, F, H, E, G\}$$

AD is a primary key here.

In $A \rightarrow BC$ non key attributes are dependent on partial key. To become a relation is second normal form every non key attribute have to fully functional dependent on primary key. Hence, above relation is not in second normal form.

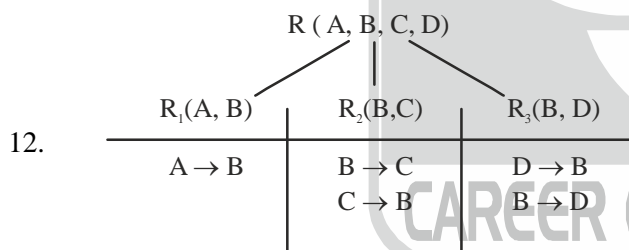
Correct option is (a)

11. Select distinct A, B

From R_1, R_2

Here, R_1 do not have any duplicate row's. Because distinct keyword will taken care of this and relation R_z is not empty.

Correct option is (b)



$R_1 \cap R_2 = B$ which is a primary key of R_2

$R_2 \cap R_3 = B$ which is a primary key of both R_2 and R_3

$R_1 \cap R_3 = B$ which is a primary key of R_3

$$R_1 \cup R_2 \cup R_3 = \{A, B, C, D\}$$

So, above relation is lossless

All the dependencies are preserved after the decomposition. So, above decomposition is also dependency preserving.

Correct option is (a)

13. The component of Memory tube display (Direct View Storage Tube) are

- Flooding gun
- Writing Gun
- Collector
- Phosphor gain
- Ground

Correct option is (d)

14. In case of oblique projection the projector rays are not perpendicular to the plane of projection.
Correct option is (d)
15. The movement of beam from the right end to the left side of the next scan line is called horizontal retrace
Correct option is (a)
16. As $X = 3 * X'$ and $Y = 4 * Y'$ lets put the value in the following equation

$$X^2 + Y^2 = 1$$

$$(3 * X')^2 + (4 * Y')^2 = 1$$
Correct option is (c)
17. Steps for normalized transformation
 (1) Translate the windows lower left corner to origin with $T_x = -1$ and $T_y = -1$.
 (2) Applying the scaling where $S_x = \frac{1}{3-1} = \frac{1}{2}$ and $S_y = \frac{1}{5-1} = \frac{1}{4}$
 The normalized transformation is
- $$= \begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1/4 & 0 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & -1/2 \\ 0 & 1/4 & -1/4 \\ 0 & 0 & 1 \end{bmatrix}$$
- Correct option is (a)**
18. There are three aspects of quantization
 • **Sampling rate** : The number of samples per second
 • **Aperture time** : The number of seconds per sample
 • **Coding error (amplitude uncertainty)** : The difference between the conditional signal and the quantized signal
Correct option is (c)
19. The logic used in pumping lemma is an example of pigeonhole principle.
Correct option is (d)
20. We need to use heap allocation for dynamic data structure. Memory at run time is allotted from heap in dynamic data structures using library functions like malloc, calloc, realloc in C and new is used in C++.
Correct option is (b)
21. The contrapositive of pumping lemma for regular language is used to prove that the given language is not regular.
Correct option is (d)
22. There exists an algorithm for the problem in option (a), (b) and (c) but there is no algorithm to solve the problem of ambiguity for CFG
Correct option is (d)
23. Finite state machine recognizes the languages generated by regular grammar
Correct option is (c)
24. The language $L = \{a^i b c^i \mid i \geq 0\}$ is deterministic CFL as we can push a ignored (b) and pop a for (c). Since every DCFL is also recursive language hence correct **option is (c)**.
25. 1 Page contains 24 line
 1 line contains 80 char
 1 Page contains (24×80) char
 Rate of transfer = 10 page/sec = (24×80×100) char/sec
 = (24×80×100×8) bit/sec ≈ 1.536 bps
Correct option is (d)

26. QAM, we vary the amplitude and phase of the carrier signal to represent the data.

Correct option is (c)

27. 50,000 char takes – 40 sec

(50,000×8) bit takes – 40 sec

In 40 sec we can transmit – (50,000×8) bit

In 1 sec – ?

$$\text{Bit rate} = \frac{50,000 \times 8}{40} \text{ bits} = 10 \text{ kbps}$$

Correct option is (d)

28. Framing is done at DLL, $a \rightarrow (iv)$

Routing is done at NL

$$b \rightarrow (iii)$$

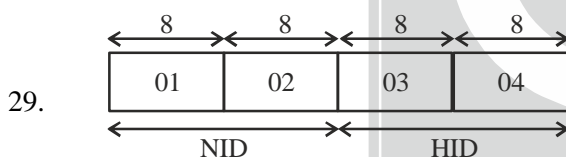
End to end connectivity is maintained by transport layer

$$c \rightarrow (ii)$$

Encryption is done at presentation layer

$$d \rightarrow (i)$$

Correct option is (d)



HID = 16 bit in class B it 6 bits are used for subnetting. Then In HID part (16–6) = 10 bits are remaining by using 6 bits we can design $(2^6 - 2)$ number of subnets = 62

By using 10 bits we can design $(2^{10} - 2)$ number of host/subnet = 1022

Correct option is (a)

30. In IPv6, fragmentation extension header contains identification, flags, fragmentation offset fields.

- Authentication extension header is new in IPv6.
- The record route option is also not implements in IPv6

Correct option is (d)

31. For a full binary tree with n internal nodes, i internal path length and e external path length the following relation is correct.

$$e = i + 2n$$

Correct option is (b)

32. Now, consider the decision tree of height h for any comparison sort for S . Since, the elements of each subsequence can be in any order, any of the $k!$ permutations correspond to the final sorted order of a subsequence. And, since there are n/k such subsequences, each of which can be in any order, there are $(k!)^{n/k}$ permutations of S that could correspond to the sorting of some input order. Thus, any decision tree for sorting S must have at least $(k!)^{n/k}$ leaves. Since a binary tree of height h has no more than 2^h leaves, we must have

$$2^h \geq (k!)^{(n/k)} \text{ or } h \geq \lg(k!)^{(n/k)}. \text{ We therefore obtain}$$

$$= (n/k) \lg(k!) \geq (n/k)(k/2) \lg(k/2) \text{ as for all } k, k! \geq (k/2)^{(k/2)} = \Omega(n \lg k)$$

Correct option is (c)

33. Using master Method $n^{\log_b a} = n^{\log_2 8} = n^3$ and $f(n) = Cn$

Hence, $T(n) = \theta(n^3)$

Correct option is (d)

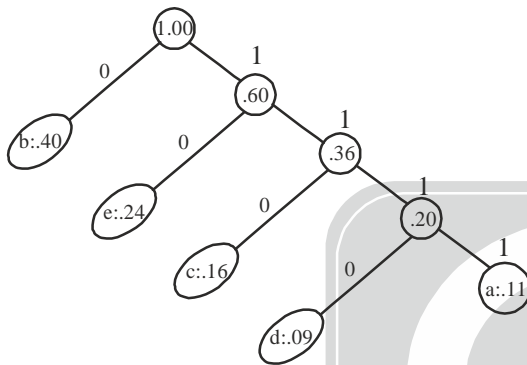
34. The longest common subsequence of $X = \langle B, C, D, C, A, B, C \rangle$ and $Y = \langle C, A, D, B, C, B \rangle$

Are $\langle C, A, B, C \rangle; \langle C, D, B, C \rangle; \langle C, D, C, B \rangle$

Length of LCS = 4

Correct option is (c)

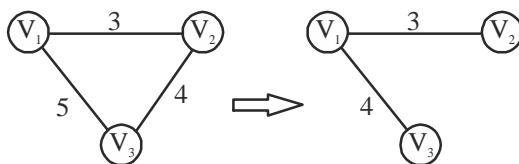
35. The huffman tree for given character is



| Character | Frequency | Codeword | Length | Frequencies |
|-----------|-----------|--------------|--------|-------------|
| a | 0.11 | 1111 | 4 | 0.44 |
| b | 0.40 | 0 | 1 | 0.40 |
| c | 0.16 | 110 | 3 | 0.48 |
| d | 0.09 | 1110 | 4 | 0.36 |
| e | 0.24 | 10 | 2 | 0.48 |
| | | Total | | 2.16 |

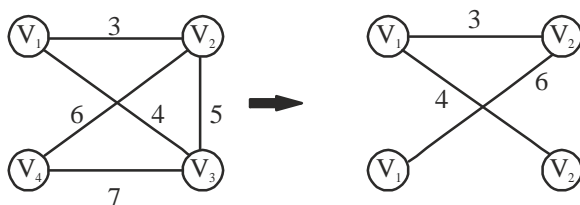
Hence, correct option is (b)

36. For a graph with $n = 3$

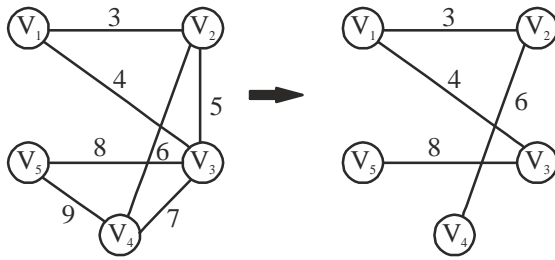


The cost of MST = $3 + 4 = 7$

For the graph with $n = 4$



The cost of MST = 3 + 4 + 6 = 13
For a graph with n = 5



The cost of MST = 3 + 4 + 6 + 8 = 21

Hence, for a graph with n = 10

The cost of MST = 3 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 = 91

We can also use these formula for such graph the cost of MST = n²-n + 1

Correct option is (b)

37. An XML document which follow all the syntax and semantic rules and all the physical as well as logical structures are known as well formed XML document

Correct option is (a)

38. Java servlet : is a server side scripting which can extend the functionality at server side. In this we do the background coding of server page. We can use the servlet only at server side (Back End)

A servlet can't use the user interface classes like swing and AWT

Statement (a) is true and statement (b) is false

Correct option is (a)

39. <tr> : Table row
<td> : Table division into columns
<colspan> : used to merge multiple columns into single one
<colspan=2> means merge 2 columns into 1
<rowspan> : used to merge multiple rows into single 1
<rowspan = 2> : means merge 2 rows's into 1 final table for the given code is

| | |
|--------|--------|
| Text A | |
| Text B | Text C |
| Text D | Text E |
| | Text F |

Correct option is (c)

40. **Character entities:** Some times when we use <(less than) >(greater than) symbols in code the browser will interpret them as start of tag and end of tag.

Example : 2 < 3 4 > 5
 └──────────┘

Browser will consider this as a Tag

So, less than will be written as <

greater than will be written as >

So, these are the character entities.

We can't use these character entities to insert an image into a webpage. So, option (a) is incorrect.

Once the server returns cookie to a browser, the cookie will be included in all future requests from the browser to the server to save the extra processing time. So, second option is correct.

Correct option is (b)

41. Multiple inheritance is not present in java. So, a class can only inherit one class but in java multiple interfaces can be implemented. So, option is (b) is true.

Final int days = 7; here days become constant static final int days = 7; Here day's are constant and common for all objects. Hence, option (a) is false

Correct option is (b)

42. In start method, the value of stra = 'do'
and strb = method (stra)
we are passing stra i.e. 'do' in method.
Now in method,

```
stra = stra + 'good'
    = 'do' + 'good'
    = 'dogood'
```

The first print statement in method function outputs 'dogood'

Now, method returns 'good'

The value of strb = 'good'

The next printf statement outputs ': " + stra + strb (local copy of stra is used)

Hence, total output is 'dogood' : dogood'

The correct option is (d).

43. Statistical software quality assurance in software engineering involves tracing each defect to its underlying cause, isolating the vital few causes and moving to correct them.

Correct option is (c)

44. White box testing check the internal logic (verification)
Black box testing check I/P to O/P term as validation

Correct option is (a)

45. Time to repairs = 5 mins
Operation time = 91.25 day = 91.25 × 24 × 60 min

$$\text{A validity (\%)} = \frac{91.25 \times 24 \times 60}{(91.25 \times 24 \times 60) + 5} \times 100 = 99.996194$$

Correct option is (d)

46. Int mcq (boolean a, boolean b, boolean c, boolean d)
{

```
1. int ans 1;
2. if(a)
3. {ans = 2; }
4. elseif(b)
5. {ans = 3;}
6. elseif (c) {
7.     if (d)
8. {ans = 4;}
9. returns ans;
```

} }

The total number of condition is 4

Hence, M1 = Number of tests to exhaustively test mcq = 2 × 2 × 2 × 2 = 16 because each condition can be either TRUE or FALSE.

To cover all the statements we need minimum 3 tests

a b c d it covers 1, 2, 3, 6 statements.

T X X X (where X is true or false)

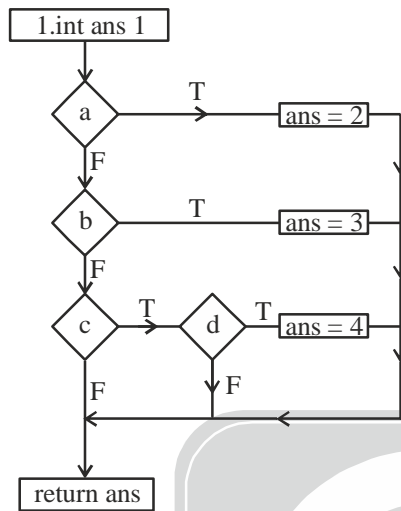
a b c d covers 1, 2, 4, 5, 6 statements and

F T X X

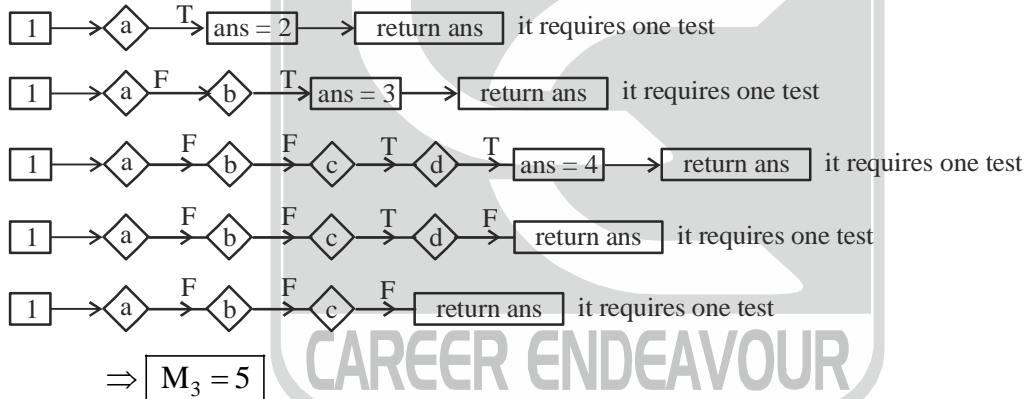
The test case a b c d covers 1, 2, 4, 6, 7, 8, 9.
F F T T

So, full statement coverage requires minimum 3 test cases $\Rightarrow M_2 = 3$

The flow chart of above program is



To cover all the branches the minimum of test cases = 5



The correct option is (a)

47. Size = 20, 000 Loc = 20 kLoc
 a = 3.4
 b = 1.5
 c = 2.5
 d = 0.38

Development effect = $a(kLoc)^b = 2.4(20)^{1.05} = 55.756$ persons.month

Developed duration = $C(DE)^d = 2.5 (55.756)^{0.38} = 11.52$ months

Correct option is (b)

48. Filling by reports and tracking their progress is not the duty of software configuration management. Here we only work on verious and their releases.

Correct option is (a)

49.

| | | | | |
|----------------|----------------|----------------|----------------|----------------|
| P ₁ | P ₂ | P ₄ | P ₁ | P ₃ |
|----------------|----------------|----------------|----------------|----------------|

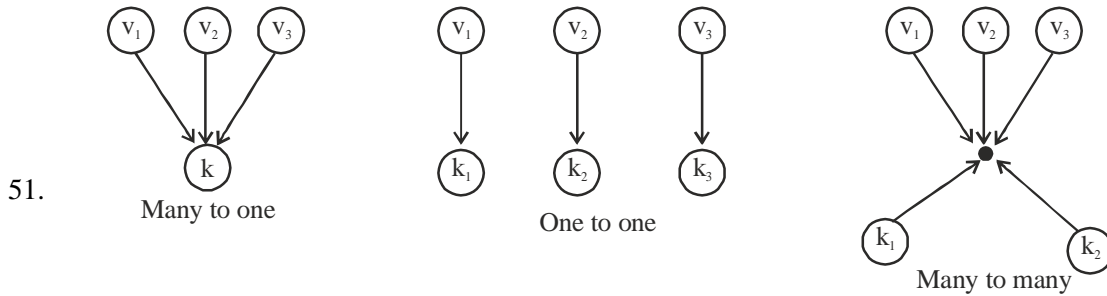
 0 1 5 10 17 26
 Wait time for P₁ = 9
 Wait time for P₂ = 0

Wait time for $P_3 = 15$
 Wait time for $P_4 = 2$
 AVG waiting time = $(9 + 0 + 15 + 2)/4 = 6.5$

Correct option is (a)

50. Optimal page replacement algo always gives minimum number of page faults. So, no need to solve the options solution is direct optimal.

Correct option is (d)



(a) is true, (b) is false

Correct option is (a)

52. Further request for P_0 and P_2 is zero. When P_0 and P_2 terminates then both the processes release the allocated resources.

$$P_0 = \langle 0 \quad 1 \quad 0 \rangle$$

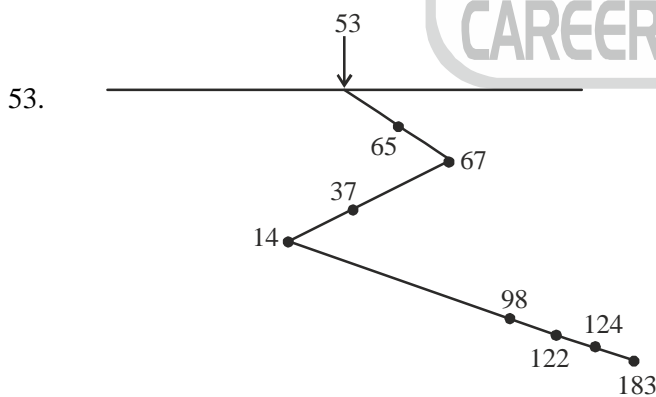
$$P_2 = \langle 3 \quad 0 \quad 3 \rangle$$

$$\text{Current available} = \langle 3 \quad 1 \quad 3 \rangle$$

Now, by using $\langle 3 \quad 1 \quad 3 \rangle$ resource we can fullneed of all the other processes one by one.

Many safe sequences are present in the current situation. So, system is not in deadlock state.

Correct option is (d)



$$\text{Number of head movements} = (67-53) + (67-14) + (183-14) = 236$$

Correct option is (c)

54. Bounded buffer problem is related to producer consumer problem. Where producer is the process which produce item's into buffer and consumer is the process which consume items from buffer producer can produce item untill buffer is fall. Because buffer is bounded i.e. size of buffer is finite.

Correct option is (a)

55. Utility based agent in AI deals with happy and unhappy state
Correct option is (d)

56. Greedy search requires to store maximum b^m nodes in worst case to find the best node to further evaluate. So, space complexity is $O(b^m)$.
Correct option is (c)

57. As it is given that $P \leftrightarrow (Q \vee \neg Q) \exists P \leftrightarrow T$ i.e. P is T

And $Q \leftrightarrow R$ we can replace Q in place of R

$$\begin{aligned} \text{Now, } (P \wedge Q) \rightarrow ((P \wedge R) \vee S) &= \neg(P \wedge Q) \vee ((P \wedge R) \vee S) \\ &= \neg(T \wedge Q) \vee ((T \wedge Q) \vee S) \text{ putting } P = T \text{ and } R = Q \\ &= \neg Q \vee Q \vee S = T \vee S = T \end{aligned}$$

Correct option is (a)

58. If X, then Y unless Z means if Z doesn't occurs X implies Y

$$\neg Z \rightarrow (X \rightarrow Y) \exists Z \vee (X \rightarrow Y) \exists Z \vee (\neg X \vee Y) \exists (Z \vee \neg X) \vee Y \exists \neg(\neg Z \wedge X) \vee Y \exists (\neg Z \wedge X) \rightarrow Y$$

Correct option is (b)

59. $F1: P \rightarrow \neg P = \neg P \vee \neg P = \neg P$ it is satisfiable

$F2: (P \rightarrow \neg P) \vee (\neg P \rightarrow P) = (\neg P \vee P) \vee (P \vee P) = \neg P \vee P = T$ it's a tautology hence valid.

Correct option is (a)

60. Standard planning algorithm assumes complete and correct information and deterministic, fully observable environments.

Correct option is (a)

61. Every recursive language is recursive enumerable. (1) is true

We can design a Turing Machine for $L = \{0^n 1^n 0^n \mid n = 1, 2, 3, \dots\}$ therefore L is Recursive enumerable and (b) is correct.

Recursive languages are closed with respect intersection therefore (c) is correct.

Correct option is (d)

62. CFLs are not closed with respect to following operations.

- Intersection
- Complementation
- Difference
- Symmetric Difference

Correct option is (b)

63. Since all the above languages are having a conditions on two powers and its is possible to have a PDA.

Correct option is (d)

64. The four point DFT matrix is as follows

$$W = \frac{1}{2} \begin{bmatrix} \omega^0 & \omega^0 & \omega^0 & \omega^0 \\ \omega^0 & \omega^1 & \omega^2 & \omega^3 \\ \omega^0 & \omega^2 & \omega^7 & \omega^6 \\ \omega^0 & \omega^3 & \omega^6 & \omega^9 \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 1 & 1 & 1 & 2 \\ 1 & +j & -1 & -j \\ 1 & -1 & 1 & -1 \\ 1 & -j & -1 & +j \end{bmatrix}$$

Hence, $x = +J$ and $y = -J$

Correct option is (d)

65.

| Base b | Units of Entropy |
|--------|------------------|
| 2 | Bits |
| E | Nats |
| 10 | Deca or decits |

Correct option is (d)

66. A binary code (n, h) linear code with minimum distance $(2t + 1)$ or greater satisfy the following

$$n - h \geq \log_2 \left[\sum_{i=0}^t \binom{n}{i} \right]$$

So, α is equal to t .

Correct option is (d)

67. **Degeneracy transportation problem:**

m = source of supply, n = demands

Optimality: Feasible requires allocation in $m + n - 1$

When the number of allocation is less than $m + n - 1$ degeneracy.

Correct option is (c)

68. $\max \quad z = 15x_1 + 10x_2$ (2 decision variables $(u_1$ and $u_2)$)

$4x_1 + 6x_2 \leq 360$... (1)

$3x_1 + 6x_2 \leq 180$... (2)

$0x_1 + 5x_2 \leq 200$... (3)

$x_1, x_2 \geq 0$

From equation (1),

$$4x_1 + 6x_2 = 360$$

If $x_1 = 0, 6x_2 = 360, x_2 = 60$ (0, 60)

If $x_2 = 0, 4x_1 = 360, x_1 = 90, x_1 = 90$ (90, 0)

From equation (2),

$$3x_1 + 0x_2 = 180$$

$$3x_1 = 180$$

$$x_1 = 60$$

From equation (3)

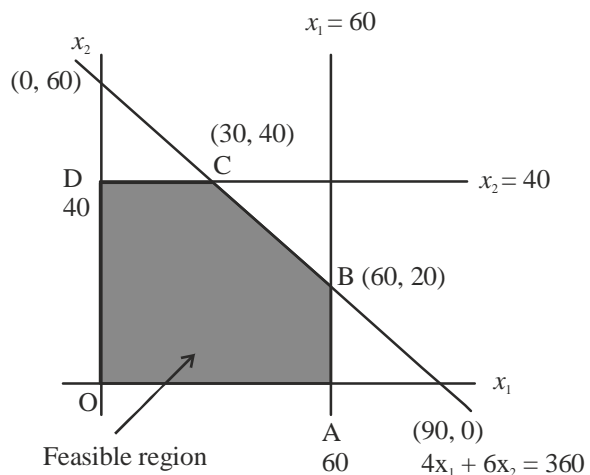
$$0x_1 + 5x_2 = 200$$

$$5x_2 = 200$$

$$x_2 = 40$$

B, point $4x_1 + 6x_2 = 360$

$$4 \times 60 + 6x_2 = 360$$



$$6x_2 = 120$$

C, point $9x_1 + 6x_2 = 360$

$$4x_1 + 240 = 360$$

$$4x_1 = 360 - 240$$

| extreme point | coordinates | $z = 15x_1 + 10x_2$ |
|---------------|-------------|---------------------|
| 0 | (0,0) | 0 |
| A | (60,0) | 900 |
| B | (60,20) | 1100 maximum |
| C | (30,40) | 850 |
| D | (0,40) | 400 |

$(x_1, x_2), (60, 20) = 1100$

Correct option is (b)

69. max $z = -2x_1 - x_2 - 3x_3$

$$x_1 - 2x_2 + x_3 \geq 4, \quad -x_1 + 2x_2 - x_3 \leq -4, \quad -x_1 + 2x_2 - x_3 + s_1 = -4$$

$$2x_1 + x_2 + x_3 \leq 8, \quad 2x_1 + x_2 + x_3 \leq 8, \quad 2x_1 + x_2 + x_3 + s_2 = 8$$

$$x_1 - x_3 \geq 0, \quad -x_1 + x_3 \leq 0, \quad -x_1 + x_3 + s_3 = 0$$

$S_1, S_2, S_3 \rightarrow$ Slag variables

max $z = -2x_1 - x_2 - 3x_3 + 0s_1 + 0s_2 + 0s_3$

Choose negative variable

| | | | | | | | |
|---------|----|----|----|---|---|---|-------|
| | -2 | -1 | -3 | 0 | 0 | 0 | x_B |
| 0 S_1 | -1 | 2 | -1 | 1 | 0 | 0 | 4 |
| 0 S_2 | 2 | 1 | 1 | 0 | 1 | 0 | 8 |
| 0 S_3 | -1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Z_j | 0 | 0 | 0 | 0 | 0 | 0 | |

$$C_j - Z_j = -2 \quad -1 \quad -3 \quad 0 \quad 0 \quad 0$$

$$\text{Ratio} = \frac{C_j - Z_j}{S_1}$$

$$\text{Ratio} = 2 \quad -\frac{1}{2} \quad 3 \quad 0 \quad 0 \quad 0$$

(min) = 2 (positive value)

$x_1 \rightarrow$ enter

$S_1 \rightarrow$ Leave

$$\begin{array}{l}
 R_2 \rightarrow R_2 + 2R_1 \\
 R_3 \rightarrow R_3 - R_1
 \end{array}$$

| | | | | | | | | |
|-----------------|----|----|----|----|---|---|-------|-------------------|
| | -2 | -1 | -3 | 0 | 0 | 0 | x_B | |
| $-2 x_1$ | 1 | -2 | 1 | -1 | 0 | 0 | 4 | } → Optimal table |
| $0 S_2$ | 0 | 5 | -1 | 2 | 1 | 0 | 0 | |
| $0 S_3$ | 0 | -2 | 2 | -1 | 1 | 0 | 4 | |
| $Z_j - Z_j = 0$ | -2 | 4 | 2 | 2 | 0 | 0 | | |

$$C_j - Z_j = 0 \quad -5 \quad -1 \quad -2 \quad 0 \quad 0$$

$$\left. \begin{array}{l}
 C_j - z_j \leq 0 \\
 X_B \geq 0
 \end{array} \right\} \rightarrow \text{optimal table}$$

$$x_1 = 4, x_2 = 0, x_3 = 0$$

$$\max \quad Z = 4 \times (-2) + 0 + 0 = -8$$

$$\min \quad Z = -(\max) = -(-8) = 8$$

Correct option is (c)

70. The Takagi-Sugeno-Kang (TSK) model was introduced by T.Takagi and M.Sugeno .This model reduce the number of rules required by Mamdani model, specially for complex and high dimensional problems. To achieve this goal, the TSK model replaces the fuzzy sets in the consequent part (then-part) of the Mamdani rule with a linear equation of the input variables, For example Two input and one output TSK model consist of rules in the form of IF x is and y is THEN z = ax+by+) Where a,b,c are numerical constants. In general, rules in a TSK model have the form IF is and y is THEN y = (, ,.....) = + + + (3.6) Where is the linear model and are real valued parameters . The inference performed by the TSK model is an interpolation of all the relevant linear models. The degree of relevance of a linear model is determined by the degree the input data belongs to the fuzzy subspace associated with the linear model . These degree of relevance become the weight in the interpolation process. 75 The total output of the model is given by the equation.The total output of the model is given by the equation below where \hat{a}_i is the matching degree of rule R_i , which is analogous to the matching degree of the Mamdani model “ “ “ “ The inputs to a TSK model are crisp (non fuzzy) numbers. Therefore, the degree the input $x_1 = a_1, x_2 = a_2, \dots, \dots, x_r = a_r$, matches ith rule is typically computed using the min operator: However the product operator can be used by equation 2.

Hence, correct option is (b)

71. The output is found by multiplying the weights with their respective inputs, summing the results. Therefore: Output = $(0.4 \times 0.2 - 0.3 \times 0.6 + 0.1 \times 0.5) = 0.08 - 0.18 + 0.05 = -0.05$ which is not greater than bias.

Hence Output of perceptron is 0.

Hence, correct option is (b)

72. A **sigmoid function** is a mathematical function having a characteristic “S”-shaped curve or **sigmoid curve**. Often, *sigmoid function* refers to the special case of the logistic function shown in the first figure and defined by the formula

$$S(x) = \frac{1}{1 + e^{-x}} = \frac{e^x}{e^x + 1}$$

Other examples of similar shapes include the Gompertz curve (used in modeling systems that saturate at large values of t) and the ogee curve (used in the spillway of some dams). Sigmoid functions have domain of all real numbers, with return value monotonically increasing most often from 0 to 1 or alternatively from “1 to 1, depending on convention.

A wide variety of sigmoid functions have been used as the activation function of artificial neurons, including the logistic and hyperbolic tangent functions. Sigmoid curves are also common in statistics as cumulative distribution functions (which go from 0 to 1), such as the integrals of the logistic distribution, the normal distribution, and Student’s t probability density functions.

Hence, correct option is (d)

73. UNIX operating system provide 3 types of permissions which we can apply on files

(1) Read (2) Write (3) Execute

and these 3 permissions are applied onto 3 sets

(1) Owner (2) Group (3) Other’s

Correct option is (c)

74. In distributed system fixed routing, virtual routing, and dynamic routing technique are used

Correct option is (d)

75. Fork () is used to create a child process having same copy of parent process

$$a \rightarrow (iii)$$

wait () is used to suspend a process which need to wait further for a signal

$$b \rightarrow (iv)$$

open () is also used to create a new file when file do not already exist then a new file is created by open

$$c \rightarrow (i)$$

clos () is used to close the file which is already opened by a process

$$d \rightarrow (ii)$$

Correct option is (a)