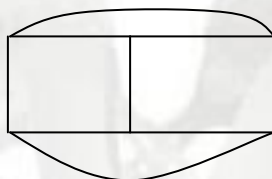


**Q.1 – Q.20 Carry One Mark Each**

1. If matrix A is of order  $3 \times 4$  and matrix B is  $4 \times 5$ . The number of multiplication operations and addition operations needed to calculate the matrix product AB  
 (A) 240, 60                      (B) 60, 45                      (C) 60, 60                      (D) 240, 32
2. The maximum value of the rank of a  $4 \times 5$  matrix is  
 (A) 4                                  (B) 5                                  (C) 9                                  (D) None
3. Maximum number of edges in a n-node undirected simple graph without cycles is  
 (A)  $n - 1$                       (B)  $\frac{n(n+1)}{2}$                       (C)  $\frac{n(n-1)}{2}$                       (D)  $n$
4. The minimum number of colours required to color the following graph is:



- (A) 1                                  (B) 2                                  (C) 3                                  (D) 4
5. For lattice  $[D_{12}; \text{divides}]$  which is not true?  
 (A) Complement of 1 is 12                      (B) Complement of 2 is 6  
 (C) Complement of 3 is 4                      (D) Complement of 2&6 doesn't exist
  6. Which of the following statements is/are true?  
 i) Spanning tree will always have  $|V| - 1$  edge  
 ii) Adding an edge to the spanning tree always creates a cycle  
 iii) The intermediate graphs obtained from both prim's and Kruskal's algorithms in finding minimum cost spanning tree are always trees  
 (A) only (i)                                  (B) only (ii)  
 (C) both (i) and (ii)                      (D) all of the above
  7. Which of the following statement is not correct?  
 (A) The complement of a recursive language is recursive  
 (B) The union of two recursive languages is recursive  
 (C) If a language L and it's complement  $L^c$  are both recursively enumerable, then L is recursive  
 (D) The union of two recursively enumerable languages is not recursively enumerable

8. Which of the following is not a valid deadlock prevention scheme?
- (A) Release all resources before requesting a new resource
  - (B) Number the resources uniquely and never request a lower numbered resource than the last one requested
  - (C) Requested and all required resources must be allocated before execution.
  - (D) None of the above
9. The Boolean function  $x'y'z' + xy'z' + x'yz' + xyz'$  is equivalent to
- (A)  $x'y$
  - (B)  $xy'$
  - (C)  $z'$
  - (D)  $y'$
10. The performance of a pipelined processor suffers if
- (A) There are instruction that change the sequence ordering of the program
  - (B) Consecutive instructions are dependent on each other
  - (C) The pipeline stages share hardware resources
  - (D) All of the above
11. How many 8-bit characters can be transmitted per second over a 8800 baud serial communication link using asynchronous mode of transmission with one start bit, 8 data bits and two stop bits ?
- (A) 1100
  - (B) 800
  - (C) 880
  - (D) 3000
12. Which of the following statement is true?
- (A) The packet addressing should be taken care by data link layer
  - (B) Dividing the transmitted bit stream into frames is done by network layer
  - (C) The network addresses is block of addresses in the first address. The mask can be ANDed with any address in the block to find the network address
  - (D) Both UDP and TCP are connectionless protocols
13. Let S and T be languages over  $\sum\{a,b\}$  represented by the regular expressions  $(a^* + b^*)^*$  and  $(a^* + b^*)^+$ , which of the following is true?
- (A)  $S \subset T$
  - (B)  $T \subset S$
  - (C)  $S = T$
  - (D)  $S \cap T = (a^* + b^*)$
14. Consider the following signed number (Negative number are represented in two's complement form)
- X = 11110101  
Y = 00001000  
Z = 11111110
- What is the result of  $\frac{(XY)}{Z}$  ?
- (A) 11010100
  - (B) 00101100
  - (C) 00011100
  - (D) 11011000

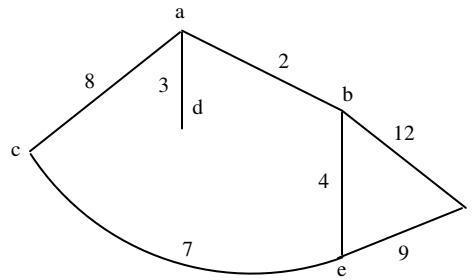
15. If an edge with weight 5 is to be inserted in the following simple graph to get 2 minimal spanning trees then where should it be inserted?

(A) df

(B) de

(C) ce

(D) Not possible to get two minimal spanning trees



16. If  $n$  numbers are inserted into a binary search tree then which of the following traversal outputs the numbers in sorted order?

(A) preorder

(B) in order

(C) post order

(D) breadth-first

### Common Data for Question Number: 17 & 18

A class B network address 130.50.0.0 is subnetted as follows. The last 10 bits of the host id are allotted for host number and the remaining 6 bits are reserved for subnet number.

17. How many subnets and number of hosts in each subnet are possible with the above addressing scheme?

(A) 62, 1022

(B) 30, 510

(C) 14, 254

(D) None of the above

18. What are the starting addresses of 1<sup>st</sup> and 4<sup>th</sup> subnets?

(A) 130.50.4.1 and 130.50.16.1

(B) 130.50.1.1 and 130.50.4.1

(C) 130.50.0.0 and 130.50.3.0

(D) None of the above

19. A serial transmission of characters is having 10 information bits, 3 stop bits, 1 parity bit, at a bit rate of 900/sec. Assume that no idle time between characters. Now compute the transfer rate in character per second (CPS)

(A) 50 CPS

(B) 60 CPS

(C) 65 CPS

(D) None of these

20. Five channels each with a 100 KHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 5 KHz between the channels to prevent interference?

(A) 480 KHz

(B) 500 KHz

(C) 520 KHz

(D) None of these

**Q.21 – Q.75 Carry Two Marks Each**

21. Which of the following statements is/are true?

S1: The transitive closure of the symmetric closure of a relation is the same as the symmetric closure of the transitive closure of this relation.

S2: The transitive closure of the symmetric closure of a relation contains the symmetric closure of the transitive closure of this relation.

- (A) Only S1 (B) Only S2 (C) Both S1 and S2 (D) None

22. Consider the following functions from  $\mathbb{Z}$  to  $\mathbb{Z}$ ,  $\mathbb{Z}$  is set of intergers

$S_1 : f(x) = x^3$  is one to one but not on to

$S_2 : f(n) = \lceil \frac{n}{2} \rceil$  is on to but not one one

Which of the following is true?

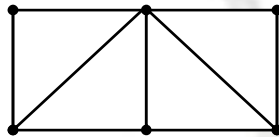
- (A)  $S_1$  is true &  $S_2$  is false (B)  $S_1$  is false &  $S_2$  is true  
(C) Both are true (D) Both are false

23. The set  $G = \{0, 1, 2, 3, 4, 5\}$  is a group with respect to addition modulo 6.

Which of the following is false?

- (A) The inverse of 2 is 4 (B) The inverse of 3 is 3  
(C) The inverse of 1 is 5 (D) The inverse of 5 is 2

24. Consider the graph shown below



Which of the following is true?

- (A) G is not Eulerian but Hamiltonian  
(B) G is Eulerian but n't Hamiltonian  
(C) G is Eulerian and Hamiltonian  
(D) G is neither Eulerian nor Hamiltonian

25. Which of the following arguments are valid

(i)  $P_1$  : Babies are illogical

$P_2$  : No body is despised who can manage a crocodile

$P_3$  : Illogical people are despised

$P$  : Babies cannot manage crocodile

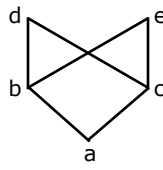
- (ii)  $P_1$  : All students are lazy  
 $P_2$  : No student is healthy  
 $P$  : Lazy people are not healthy  
 (A) (i) only (B) (ii) only (C) Both A & B (D) None
26. Given  $P(B) = \frac{3}{4}$ ,  $P(A \cap B \cap \bar{C}) = \frac{1}{3}$  and  $P(\bar{A} \cap B \cap \bar{C}) = \frac{1}{3}$ ,  $P(B \cap C) =$   
 (A)  $\frac{1}{12}$  (B)  $\frac{1}{9}$  (C)  $\frac{1}{15}$  (D)  $\frac{1}{18}$
27. If the following degree vertex, (5, 3, 2, 4, 3), can't form a simple graph then which of the following degree vertex should be added to make it form a simple graph?  
 (A) 1 (B) 5  
 (C) 2 (D) None of the above
28. A six faced fair die is thrown until 1 comes, then the probability that 1 comes in the even number of trials is:  
 (A)  $\frac{5}{11}$  (B)  $\frac{5}{6}$  (C)  $\frac{6}{11}$  (D) None
29. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by Simpson's  $\frac{3}{8}$ th rule.  
 (A) 1.4262 (B) 1.3571 (C) 1.4056 (D) None
30. In a lottery, 2 tickets are drawn at a time out of 6 tickets numbered from 1 to 6. The expected value of the sum of the numbers on the tickets drawn is  
 (A) 7 (B) 6 (C) 5 (D) 4
31. The following propositional statement is  
 $[(p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow [(p \vee q) \rightarrow r]$   
 (A) Tautology (B) Contradiction  
 (C) Neither tautology nor contradiction (D) Not decidable
32. Which of the following statements is not true?  
 (A) If  $z$  is the set of integers and  $\leq$  is the usual ordering on  $z$ , then  $[z; \leq]$  is partially ordered and totally ordered  
 (B) If  $z$  is the set of integers and  $\leq$  is the usual ordering on  $z$ , then  $[z; \leq]$  is partially ordered but not totally ordered  
 (C)  $U$  be an arbitrary set and  $A = P(U)$  be the collection of all subsets of  $U$ . Then  $[P(U); \subseteq]$  is a poset  
 (D) If  $U$  contains more than one element then it is not totally ordered

33. What does the following recurrence relation evaluates to?

$$a_n = a_{n-1} + 3^n \text{ where } a_0 = 1$$

- (A)  $\frac{(3^n - 1)}{2}$  (B)  $\frac{(3^{n+1} - 1)}{2}$  (C)  $\frac{(3^{n+2} - 1)}{2}$  (D)  $\frac{(3^{n-1} - 1)}{2}$

34. Which of the following is true?

(A) The Poset  $P = \{a, b, c, d, e\}$  with hasse diagram  is a lattice

(B) For the lattice   $\{x, a, b, y\}$  is a sub lattice

(C) The lattice is  is distributive

(D) None of the above

35. If A, B and C are sets then which of the following is true?

- a)  $(A - B) - C \subseteq (A - C)$   
 b)  $(A - C) \cap (C - B) = (A - B)$   
 c)  $(B - A) \cup (C - A) = (B \cup C) - A$

(A) Only a and c

(B) Only b and c

(C) Only a and b

(D) All a, b, c

36. How many letters of six lowercase letters from the English alphabet contain the letters p and q, where p is somewhere to the left of q in the string, with all the letters distinct?

(A) 159,390

(B) 7,650,720

(C) 3,825,360

(D) None of the above

37. In which order the following numbers, 10, 3, 2, 4, 6, 7, 5, 1, should be inserted in an empty binary search tree to get a search tree of height 5?

(A) 1, 2, 3, 6, 5, 7, 10, 4

(B) 1, 2, 3, 5, 10, 6, 7, 4

(C) 1, 2, 3, 4, 6, 7, 10, 5

(D) 1, 2, 3, 10, 4, 7, 6, 5

38. In which order the following numbers, 7, 5, 1, 8, 3, and 2, should be inserted into an empty binary search tree to get in order and preorder traversal sequences as same.

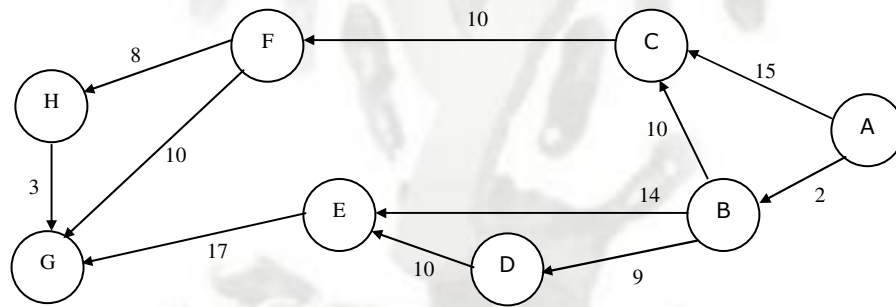
(A) 3, 2, 1, 8, 7, 5

(B) 8, 7, 5, 3, 2, 1

(C) 1, 2, 3, 5, 7, 8

(D) 3, 2, 8, 7, 5, 1

39. If a queue is implemented using an array then what are the worst case time complexities of both enqueue and dequeue operations  
 (A)  $O(1)$ ,  $O(n)$  (B)  $O(n)$ ,  $O(1)$  (C)  $O(1)$ ,  $O(1)$  (D)  $O(n)$ ,  $O(n)$
40. If the following elements, 5, 3, 4, 2, 6, 7, and 1, are inserted into a max heap then what is printed for an in order traversal of the heap  
 (A) 2, 5, 3, 7, 4, 6, 1 (B) 3, 5, 2, 7, 4, 6, 1  
 (C) 4, 6, 3, 7, 2, 5, 1 (D) 4, 6, 3, 7, 1, 5, 2
41. If the read/write head of a disk starts at track 100 and the disk has requests pending to tracks 43, 158, 44, 203 and 175, what is the total number of tracks that the read/write head will cross to satisfy these requests under the following disk scheduling technique?  
 (a) FCFS (1) 263 tracks  
 (b) SSTF (2) 473 tracks  
 (c) LOOK (3) 217 tracks  
 (A) a2 b3 c1 (B) a1 b2 c3 (C) a2 b1 c3 (D) none
42. If we run Dijkstra's single source shortest path algorithm on the following edge-weighted directed graph with vertex 5 as the source



- In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized.  
 (A) A, B, D, C, E, H, G, F (B) A, B, D, C, E, F, H, G  
 (C) A, B, D, C, E, F, G, H (D) A, B, D, C, E, G, F, H
43. Consider the following C program
- ```

struct cellNode {
    struct cellNode *leftChild;
    int element;
    struct cellNode *rightChild;
};

int value = 0;
void DoSomething (struct cellNode *ptr)
  
```

```

{
    if ( (ptr->leftChild == NULL) && (ptr->rightChild == NULL))
        value++;
    else {
        if (ptr->leftChild)
            DoSomething(ptr->leftChild);
        if (ptr->rightChild)
            DoSomething(ptr->rightChild);
    }
}

```

What does "value" contain at the end of all calls when a pointer to the root of a non-empty tree is passed as an argument

- (A) The number of nodes in the tree
- (B) The number of leaf nodes in the tree
- (C) The number of internal nodes in the tree
- (D) The height of the tree

44. What does the following function do?

```

void DoSomething (struct cellNode *ptr)
{
    struct cellNode *tmpptr;
    if (ptr) {
        tmpptr = ptr->leftChild;
        ptr->leftChild = ptr->rightChild;
        ptr->rightChild = tmpptr;
        if (ptr->leftChild)
            DoSomething(ptr->leftChild);
        if (ptr->rightChild)
            DoSomething(ptr->rightChild);
    }
}

```

- (A) Swaps the left and right children of every node
- (B) Swaps only the root and right children of intermediate nodes
- (C) Swaps only the root and left children of intermediate nodes
- (D) None of the above

45. Consider the following C program?

```

int f (int n)
{
    if (n <= 1)        return 1;
    n = (n - 1)2 - 2 - n2 + 3 * n;
    f(n);
    printf("%d ", n);
}

```



What is the output, if the initial call is  $f(6)$

46. What is printed for the following c program?

(D) None of the above

(D)  $O(2^n)$

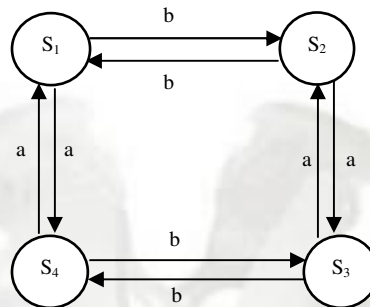
49. How many states are possible in the smallest finite automata that accepts the following language?

$L = \{x \mid x \text{ is a binary string with number of 0's divisible by 2 and number 1's divisible by 3}\}$

(A) 6 (B) 5 (C) 3 (D) 2

50. If the following Automata has to accept the following language then which states should be marked as final?

$L = \{w \mid w \in \{a, b\}^*, w \text{ has an odd number of a's and even number of b's or } w \text{ has an odd number of b's and even number of a's}\}$



- (A)  $S_1 \& S_3$  (B)  $S_2 \& S_4$  (C)  $S_1 \& S_2$  (D)  $S_2 \& S_3$
51. Let  $L$  denote the language generated by the grammar  $S \rightarrow 00T, T \rightarrow 11S \mid 11$ . If  $S$  is the start symbol then which of the following is true?
- (A)  $L = (0 + 1)^*$  (B)  $L$  is regular but not  $(0 + 1)^*$   
 (C)  $L$  is context free but not regular (D)  $L$  is not context free

52. Which of the following grammars violate Chomsky Normal Form

(i)  $S \rightarrow AB, A \rightarrow a, B \rightarrow \epsilon \mid b$

(ii)  $S \rightarrow AcB, A \rightarrow a, B \rightarrow b$

(iii)  $S \rightarrow AB, A \rightarrow a, B \rightarrow b$

(A) All of the above

(B) (i) only

(C) (i) & (ii) only

(D) (ii) & (iii) only

53. What is the equivalent CFL for the following CFG  $S \rightarrow 0|1| \in |0S0|1S1$

(A)  $\{x \mid x \text{ is a palindrome (string reading same forward as backward)}\}$

(B)  $\{x \mid x = 0^n 1^n \text{ for } n \geq 0\}$

(C)  $\{x \mid x \text{ has equal number of 0's and 1's}\}$

(D)  $\{x \mid x = 1^n 0^n \text{ for } n \geq 0\}$

54. Which language does the following PDA accept?

$M = (\{q_0, q_1\}, \{0, 1\}, \{Z_0, X\}, \delta, q_0, Z_0, \emptyset)$  and  $\delta$  is given by

$\delta(q_0, 1, Z_0) = \{(q_0, XZ_0)\}$ ,  $\delta(q_0, 1, X) = \{(q_0, XX)\}$ ,

$\delta(q_0, 0, X) = \{(q_1, X)\}$ ,  $\delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$ ,

$\delta(q_1, 1, X) = \{(q_1, \epsilon)\}$ ,  $\delta(q_1, 0, Z_0) = \{(q_0, Z_0)\}$

(A)  $L = \{1^n 01^n 0, \text{ where } n \geq 1\}$

(B)  $L = \{1^n 01^n, \text{ where } n \geq 0\}$

(C)  $L = \{1^n 01^n, \text{ where } n \geq 1\}$

(D)  $L = \{1^n 01^n, \text{ where } n \geq 0\}$

55. A Unix style I-node has 8 direct pointers, one single, one double and one triple indirect pointers. Disk block size is 1KB, disk block address is 32 bits. What is the maximum possible file size represented by triple indirect pointer?

(A)  $2^{24}$  bytes

(B)  $2^{32}$  bytes

(C)  $2^{34}$  bytes

(D)  $2^{48}$  bytes

56. What is the average waiting time for the following jobs if preemptive SJF scheduling algorithm is used?

| Job | Arrival Time | Burst Time |
|-----|--------------|------------|
| J1  | 0            | 3          |
| J2  | 1            | 3          |
| J3  | 2            | 1          |
| J4  | 3            | 2          |

(A) 2

(B) 1.75

(C) 1.5

(D) 2.25

57. Consider a machine with 128MB physical memory and a 32-bit virtual address space. If the page size is 2KB, what is the approximate size of the page table?

(A) 2MB

(B) 4MB

(C) 8MB

(D) 16MB

58. The main memory size is assumed to be 4KB and the page size is 1KB. If LRU (Least Recently Used) algorithm is used for page replacement then what pages should reside in main memory at the end for the following sequence of page references ?

4, 8, 2, 3, 2, 8, 3, 1, 2, 6, 7

(A) 1, 6, 2, 7

(B) 2, 4, 7, 8

(C) 1, 2, 6, 7

(D) 1, 2, 3, 8

59. A circuit takes a number in the form of 4 bits. If the sum of bits is  $\geq 3$  then the circuit outputs a 1. Otherwise it outputs a 0. If n-input AND gates, n-input OR gates and 1-input NOT gates are provided, what is the maximum number of gates required to implement the circuit?

(A) 3

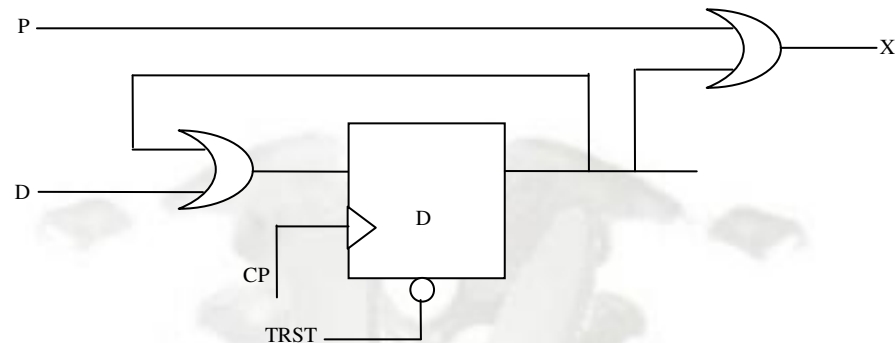
(B) 4

(C) 5

(D) 6

60. Consider a multiplexer with X and Y as data inputs and Z as control input. Z = 0 selects input X and Z = 1 selects input Y. What are the connections required to realize the 2-variable Boolean function  $f = TR$  without using any additional H/W.
- (A) Connect R to X, 1 to Y, and T to Z  
 (B) Connect R to X, 0 to Y, and T to Z  
 (C) Connect 0 to X, R to Y, and T to Z  
 (D) Connect 1 to X, R to Y, and T to Z

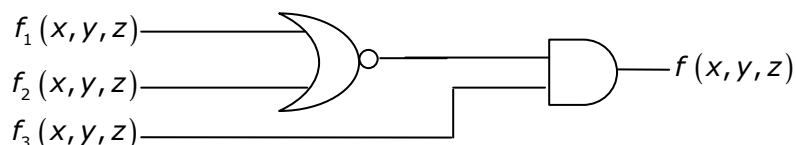
61. In the following circuit the initial value of X is 1 and P is 0 when the circuit is initialized. A 0 on TRST resets the flip-flop. What logic values should be applied to get a '0' on X?



- (A) D = 0, P = 0  
 (B) TRST = 0, P = 0  
 (C) D = 1, P = 0  
 (D) None of the above
62. What is the minimum sum of product expression for  $f(w, x, y, z)$  shown in the following Karnaugh-map?

|    |    | wx |    |    |    |
|----|----|----|----|----|----|
|    |    | 00 | 01 | 11 | 10 |
| yz | 00 | 0  | 1  | 1  | 0  |
|    | 01 | 1  | 0  | 0  | 1  |
|    | 11 | 1  | 0  | ×  | 1  |
|    | 10 | 0  | ×  | ×  | 0  |

- (A)  $zx + z'x$   
 (B)  $zx' + z'x$   
 (C)  $yx' + zx'$   
 (D)  $yx' + zx$
63. Consider the following logic circuits whose inputs are functions  $f_1, f_2, f_3$  and output  $f$  is:

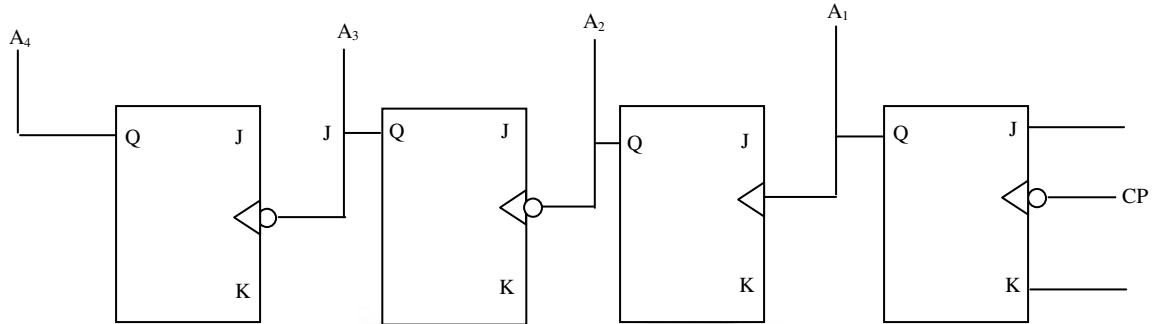


Given that  $f_1(x, y, z) = \sum(0, 1, 3, 5)$ ,  $f_2(x, y, z) = \sum(6, 7)$  and  $f_3(x, y, z) = \sum(1, 4, 5)$

What is  $f(x, y, z)$ ?

- (A)  $\sum(4)$  (B)  $\sum(4,5)$  (C)  $\sum(1,4,5)$  (D)  $\sum(6,7)$

64. If the initial values of  $A_4A_3A_2A_1 = 0110$ , what are the outputs of  $A_4A_3A_2A_1$  after CP is triggered and the inputs (J, K) of all flip flops are tied to 1?



- (A) 1001 (B) 0100 (C) 0111 (D) 0110

65. Consider the following relation schema.

Supplier(S#, Sname),

Parts(P#, Color)

Catalog (S#, P#, Cost)

select distinct Sname

from Suppliers

where S# in (select S#

from Catalog

where S# in (select P#

from Parts

where Color = 'red'));

What does the above SQL query produces?

- (A) Get supplier names for suppliers who supply only RED parts  
(B) Get supplier names for suppliers who supply at least one red part  
(C) Get supplier names for suppliers who do not supply red parts  
(D) None of the above

66. A relation R is defined as R(S#, STATUS, CITY, SNAME) where S# is the primary key. If R decomposed into two relations  $R_1$  and  $R_2$ , which of the following is a loseless decomposition?

- (A)  $R_1(S#, STATUS)$ ,  $R_2(S#, CITY, SNAME)$   
(B)  $R_1(S#, STATUS)$ ,  $R_2(STATUS, CITY, SNAME)$   
(C)  $R_1(S#, STATUS, CITY)$ ,  $R_2(CITY, SNAME)$   
(D)  $R_1(S#, STATUS, SNAME)$ ,  $R_2(CITY, STATUS)$

67. R is a relation with attributes A, B, C, D and the following FDs:  
 $A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C, AC \rightarrow D$   
 What is the equivalent irreducible set of FDs for the above set:  
 (A)  $A \rightarrow B, B \rightarrow C, A \rightarrow D$  (B)  $A \rightarrow B, B \rightarrow C, A \rightarrow C$   
 (C)  $A \rightarrow B, A \rightarrow C, A \rightarrow D$  (D)  $A \rightarrow B, B \rightarrow C, C \rightarrow D$
68. A relation NADDR is defined with attributes NAME (unique), STREET, CITY, STATE and ZIP. For any given ZIP, there is just one CITY and STATE. What is the highest normal form satisfied by above decomposition?  
 (A) 1NF (B) 2NF (C) 3NF (D) BCNF

**Common Data Question Number: 69 & 70**

- Consider the following relation schema pertaining to a student's database  
 student (rollno, name, courseno)  
 Enroll(rollno, courseno, coursename)
69. Where the primary keys are underlined. The number of tuples in the student and Enroll tables is 30 and 40 respectively.  
 If the natural join is performed on rollno, what are the maximum and minimum number of tuples that are possible ?  
 (A) 30, 30 (B) 120, 30 (C) 40, 30 (D) 120, 40
70. If the natural join is performed on courseno, what are the maximum and minimum numbers of tuples possible?  
 (A) 30, 30 (B) 120, 30 (C) 40, 30 (D) 120, 40
71. Statement 1 (S<sub>1</sub>): In fly by single cycle transfer source data is not passed directly.  
 Statement 2 (S<sub>2</sub>): In fly by single cycle transfer source data is not stored internally.  
 (A) Both (S<sub>1</sub>) and (S<sub>2</sub>) are true and (S<sub>1</sub>) is the reason for (S<sub>2</sub>)  
 (B) Both (S<sub>1</sub>) and (S<sub>2</sub>) are true but (S<sub>1</sub>) is not the reason for (S<sub>2</sub>)  
 (C) (S<sub>2</sub>) is true but (S<sub>1</sub>) is false  
 (D) (S<sub>2</sub>) is false but (S<sub>1</sub>) is true
72. Which of the following statement is true & which one is false.  
 i. In case of black box testing, test cases are selected on the basis of specification.  
 ii. In case of statement testing under white box testing, every statement in the program must be executed atmost once.  
 iii. At the time of black box testing, codes are checked thoroughly.

iv. Functional testing focuses on inputs, outputs and principal functions of software.

- (A) TTFF (B) TTTT (C) TFTT (D) TFFT

73. Which portion of the Requirement Analysis is known as Gold Plating?

- (A) Requirements that do more than what is needed  
(B) Requirements that do less than what is needed  
(C) Requirements that do exactly what is supposed to do  
(D) The time when requirement is verified from the client

**Common Data for Questions Number: 74 & 75**

74. Consider following grammar

$S \rightarrow aSb \mid aAb \mid aBb$

$A \rightarrow aA \mid a$

$B \rightarrow Bb \mid b$

The language is

- (A)  $\{a^i b^j \mid i \geq j\}$  (B)  $\{a^i b^j \mid j \geq i + 1\}$  (C)  $\{a^i b^j \mid |i - j| \geq 1\}$  (D)  $\{a^i b^j \mid i \geq j + 1\}$

75. The string which does not belong to the grammar is

- (A) aabbb (B) aaabb (C) aaab (D) aabb

**Linked Answer Questions: Q.76 to Q.85 Carry Two Marks Each**

**Linked Answer Questions: 76 & 77**

76. Let us say that a queue is implemented using stacks.

What are the minimum number of stacks needed to represent it

- (A) 1 (B) 2 (C) 3 (D) 4

77. For the above representation what are the time complexities of enqueue and dequeue operations.

- (A)  $O(1)$ ,  $O(n)$  (B)  $O(n)$ ,  $O(n)$   
(C)  $O(1)$ ,  $O(1)$  (D) None of the above

### Linked Answer Questions: 78 & 79

78. Suppose we want to synchronize two concurrent processes P and Q using binary semaphores S, T and U.

**Process P:**

P(S)  
P(T)  
P(U)  
Print 'a';  
Print 'b';  
V(S)  
V(T)  
V(U)

**Process Q:**

W:  
X:  
Y:  
print 'a';  
print 'b';  
A:  
B:  
C:

What statements should be written at W if no deadlock should occur?

- (A) P(T)  
(B) P(U)  
(C) P(S)  
(D) Not possible to avoid deadlock
79. What should be written at X and Y for the above problem?
- (A) P(S), P(T) (B) P(T), P(U)  
(C) P(S), P(U) (D) None of the above

### Linked Answer Questions: 80 & 81

Consider the following assembly language program for a hypothetical processor. A, B and C are 8 bit integers. The meanings of various instructions are shown as comments.

```
MOV          B, #0; B ← 0
MOV          C, #8; C ← 8
Z:  CMP      C, #0; compare C with 0
    JZX      ; Jump to X if zero flag is set
    SUBC, #1 ; C ← C - 1
    LRCA, #1 ; Left rotate A through carry by one bit. Thus if the
              Initial value of A and the carry flag are a7a6...a0 and c0
              Respectively, their values after the execution will be
              a6a5...a0c0 and a7 respectively.
    JC  Y     ; Jump to Y if carry flag is set
    JMP Z    ; Jump to Z
Y:  ADD B, #1 ; B ← B + 1
    JMP Z    ; Jump to Z
X:
```



80. If the initial value of register A is  $A_0$ , the value of register B after the program execution will be  
 (A) The number of 0 bits in A (B) The number of 1 bits in A  
 (C)  $A_0$  (D) 8
81. Which of the following instructions should be inserted at location X to ensure that the value of register A after program execution is the same as its initial value.  
 (A) NOP (B) LRC A, #1 (C) ADD A, #1 (D) RRC A, #1

**Linked Answer Question: 82 and 83**

82. The minimum number of nodes in an AVL tree of height h is,  
 (A)  $S(h) = S(h-1) + S(h-2)$  (B)  $S(h) = S(h-1) + S(h-2) + 1$   
 (C)  $S(h) = S(h-1) + S(h-2) - 1$  (D) None
83. At least how many numbers of nodes are there in an AVL tree of height 4  
 (A) 11 (B) 15 (C) 10 (D) 12

**Linked Answer Questions: 84 & 85**

84. Which of the following function require the minimum number of NAND gates required to implement?  
 (A)  $F = AB + C'$  (B)  $F = A \oplus C$  (C)  $F = ABC$  (D)  $F = B \odot C$
85. What will be the required input to the following 4 to 1 Mux to realize the above function?

