

Q. No. 1 – 25 Carry One Mark Each

1. Consider an array $[a_1 a_2 \dots a_n]$ of size n . The resultant array after swapping the alternate elements of array is $[a_2 a_1 a_4 a_3 a_6 a_5 a_8 a_7 \dots a_n a_{n-1}]$. The temporary storage required to perform the above operation will be
(A) $O(n)$ (B) $O(1)$ (C) $O(n^2)$ (D) $O(\log n)$
2. Consider the following program

```
#include<stdio.h>
main()
{
float a ;
int x = 6, y = 5;
a = x/y;
print("Value of a = %f\n", a);
return 0;
}
```

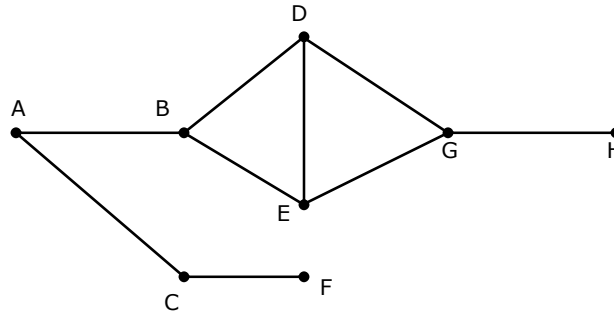
The value printed for a is
(A) 1.200000 (B) 1.000000 (C) 1 (D) None of these
3. In the Tower of Hanoi problem, if the number of disks is "4" then the number of moves required to solve the problem is_____.
4. If A is an orthogonal matrix, then $|A|$ is
(A) 0 (B) -1 (C) 1 (D) ± 1
5. How many labelled simple graphs are possible with n vertices?
(A) $2^{n/2}$ (B) 2^n (C) $2^{n(n-1)/2}$ (D) n^2
6. In a football championship, 153 matches were played. Every team played one match with each other. The number of teams participating in the championship is_____.
7. The octal value of hexadecimal number AB123 is
(A) $(2540443)_8$ (B) $(2540423)_8$ (C) $(2530443)_8$ (D) $(2440443)_8$
8. In a six –segment pipeline where each segment takes 1 cycle. (Assume there are no stalls), the number of clock cycles required to process 200 tasks in a six –segment pipeline is _____ cycles.

9. Which of the following statement is correct?
(A) Regular languages are closed under infinite union
(B) Context free languages are closed under intersection
(C) Regular languages are closed under substitution
(D) Context free languages are not closed under substitution
10. Given two regular expressions
 $r = (0^*1^*)^*$ and $s = 0^* + 1^* + 0^*1 + 10^*$
The length of the smallest string that is present in language corresponding to regular expression 'r' and not present in the language corresponding to regular expression 's' is _____.
11. Remove the left-recursion from the following grammar:
 $E \rightarrow Ea \mid Eb \mid a \mid b$
(A) $E \rightarrow aE' \mid bE' ; E' \rightarrow aE' \mid bE' \mid \epsilon$ (B) $E \rightarrow aE' \mid bE' ; E' \rightarrow aE \mid bE \mid \epsilon$
(C) $E \rightarrow aE' \mid bE' \mid \epsilon ; E' \rightarrow aE' \mid bE' \mid \epsilon$ (D) Both (A) and (B)
12. Which of the following statement(s) is/are true?
 S_1 : Right recursion is needed for termination in predictive parsers.
 S_2 : Left recursion requires more stack space than right recursion.
 S_3 : Left recursion works fine in bottom-up parsers.
(A) S_1 and S_2 (B) S_1 and S_3 (C) S_2 and S_3 (D) S_1, S_2 and S_3
13. Assume that n processors are sharing the system bus. If p is the probability that any CPU can request for bus, then the probability that only one CPU gets the bus is
(A) $np(1-p)^{n-1}$ (B) $p(1-p)^{n-1}$ (C) $n(1-p)^n$ (D) $n(1-p)^{n-1}$
14. Consider the following program fragment.

```
{  
char w1[210];  
printf("enter text");  
scanf("%s",&w1);  
printf("%s",w1);  
}
```


What is the output of the program if we enter Good Morning?
(A) Good Morning (B) GoodMorning (C) Good (D) None of these

15. Consider the following graph:



The set of articulation points of the above graph is

- (A) {A, B, C, F} (B) {A, B, C, G} (C) {A, B, C} (D) {A, B, G}
16. A system call is
- (A) the interface between the operating system and the hardware
(B) the interface between the operating system and the process
(C) the interface between the hardware and the user programs
(D) all of these

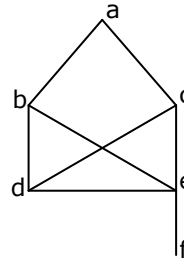
17. BFS of following graph starting from a will be

(A) a c b f d e

(B) a d e b c f

(C) a b d c e f

(D) a b c d e f



18. Match the following two lists:

List-I	List - II
P. Distance vector routing	1. Shortest path first
Q. Link – state routing	2. large topology
R. Flooding	3. Split-Horizon hack
S. Hierarchical routing	4. Duplicate packets
(A) P-1, Q-2, R-3, S-4	(B) P-3, Q-1, R-4, S-2
(C) P-2, Q-3, R-1, S-4	(D) None of these

19. If A, B, C, D are four non singular matrices such that $ABCD = I$ then $(B^{-1})^T =$ _____

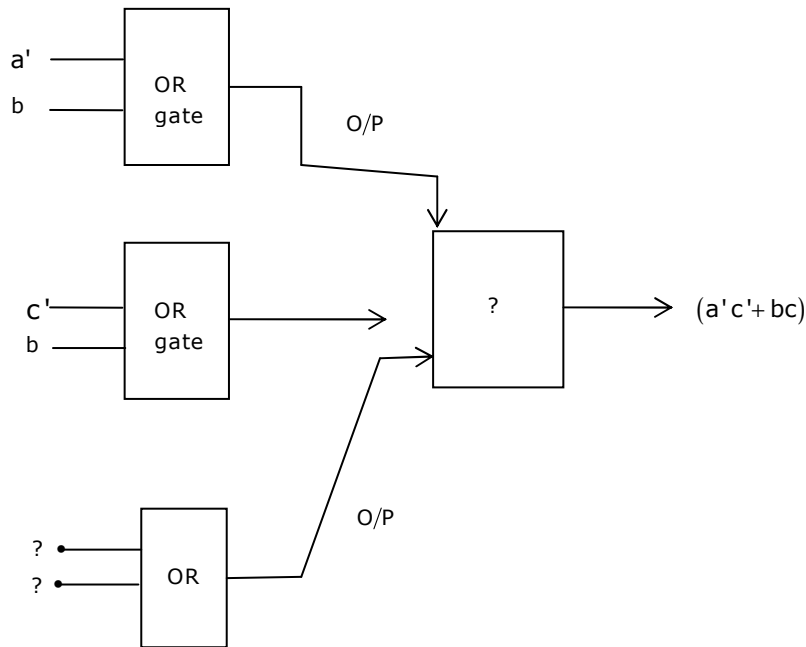
(A) CDA (B) ADC (C) $C^T D^T A^T$ (D) $A^T D^T C^T$

20. The prefix expression for the following is
 $((2 + 3) * 4 + (5 * (6 + 7) * 8) + 9)$
(A) $++*+234**5+6789$ (B) $+*+*2345 ++ 5* 6789$
(C) $+*++ 234 **5 +6789$ (D) $+* +* 234 ++ 5* 6789$
21. In which of the following order any given set of numbers should be inserted in binary search tree to get in-order and post-order traversal same?
(A) Increasing order (B) Decreasing order
(C) Not possible (D) any order
22. What is the order of the following recurrence relation?
 $a_{n-1} + a_{n-2} = 5a_n$
(A) 1 (B) 2 (C) 3 (D) 4
23. What is the independence number of w_n ($n \geq 3$) with $n+1$ vertices?
(A) n (B) $\left\lfloor \frac{n}{2} \right\rfloor$ (C) 1 (D) none
24. Total number of subsets of even cardinality of set A is 32. The cardinality of A is _____.
25. The 40-20-40 rule suggests that the least amount of development effort be spent on
(A) Estimation and planning (B) analysis and design
(C) Coding (D) testing

Q. No. 26 – 51 Carry Two Marks Each

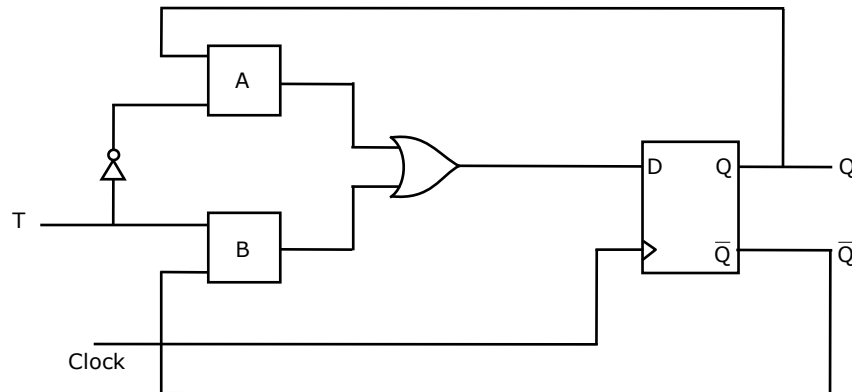
26. Consider the binary relations R and S on non-empty set A. Both R and S are reflexive. Which of the following is true?
- | | |
|----------------------------|----------------------------|
| 1. $R \cup S$ is reflexive | 2. $R \cap S$ is reflexive |
| 3. $R - S$ is reflexive | 4. $R - S$ is irreflexive |
| 5. $S - R$ is reflexive | 6. $S - R$ is irreflexive |
- (A) 1,2,4,6 (B) 1,2,3,5 (C) All (D) None of these

27. Let f be a function from A to B and f^{-1} exist. Let S and T be subsets of B . Which of the following is true?
1. $f^{-1}(S \cup T) = f^{-1}(S) \cup f^{-1}(T)$
 2. $f^{-1}(S \cap T) = f^{-1}(S) \cap f^{-1}(T)$
- (A) 1 (B) 2 (C) both (D) none of these
28. A coin is tossed five times. Probability of getting at least 2 heads and 1 tail is
- (A) $\frac{25}{32}$ (B) $\frac{27}{32}$ (C) $\frac{5}{6}$ (D) $\frac{11}{16}$
29. What are the inputs to third OR gate and name the unknown gate?



- (A) (a, c') , (NOT gate) (B) (a', c) , (NOT gate)
- (C) (a', c) , (AND gate) (D) None of these

30. What should A and B be in order to make this circuit behave like a T-flip flop?



- (A) A – And
B – And
- (B) A – Nand
B – Nand
- (C) A – And
B – OR
- (D) A – NOR
B – OR
31. Consider the following PDA transmissions
- $\delta(q_0, a, z_0) \rightarrow (q_0, Xz_0)$
 - $\delta(q_0, a, X) \rightarrow (q_0, X)$
 - $\delta(q_0, b, X) \rightarrow (q_1, \epsilon)$
 - $\delta(q_1, b, z_0) \rightarrow (q_1, z_0)$
 - $\delta(q_1, \epsilon, z_0) \rightarrow (q_1, \epsilon)$
- Where $Q = \{q_0, q_1\}$, $\Sigma = \{a, b\}$, $\Gamma = \{z_0, X\}$, $\delta, q_0, z_0, F = \{\phi\}$
- What is the language accepted by the above push down machine?
- (A) $L = \{a^n b^n \mid n \geq 1\}$
- (B) $L = \{a^n b^m \mid n, m \geq 1\}$
- (C) $L = \{a^n b^m \mid n \neq m\}$
- (D) $L = \{a^n b^m \mid n = 2m\}$
32. A block of addresses is granted to a small organization. One of the addresses is 193.16.39.175/26. What is the first and last address of this block?
- (A) 193.16.39.128 and 193.16.39.191
- (B) 193.16.39.144 and 193.16.39.207
- (C) 193.16.39.128 and 193.16.39.159
- (D) 193.16.39.160 and 193.16.39.223
33. In IEEE 802.5, the data rate of the link is 5Mbps, transmission speed is 2×10^8 m/sec. Number of stations is 25 and they are separated by 200meters each and bit rate in each station is 7.5bits. Then find the ring latency. (in μ sec, in bits)
- (A) 67.5, 325
- (B) 62.5, 312.5
- (C) 25.375, 125
- (D) 25.125, 123.5

34. Which of the following statement(s) is/are true about LALR(1) parsers?
- S_1 : LALR(1) parsers have same number of states as SLR(1) parsers (core LR(0) items are the same).
 S_2 : LALR(1) derived from LR(1) with no shift-reduce conflict will also have no shift-reduce conflict.
 S_3 : LALR(1) may create reduce-reduce conflict which was not in LR(1) from which LALR(1) is derived.
- (A) S_1 and S_2 (B) S_1 and S_3 (C) S_2 and S_3 (D) S_1, S_2 and S_3

35. The Eigen vector corresponding to the least Eigen value of

$$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix} \text{ is}$$

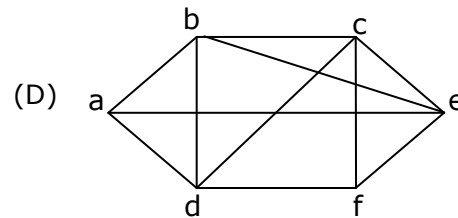
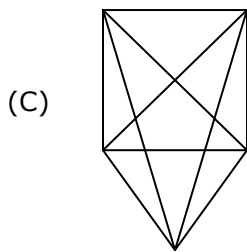
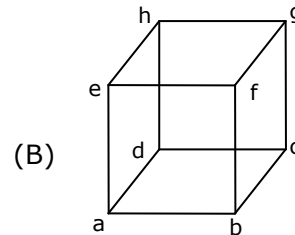
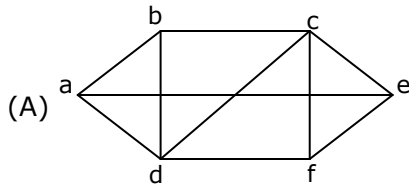
(A) $\begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}$

(B) $\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$

(C) $\begin{bmatrix} -2 \\ 1 \\ 3 \end{bmatrix}$

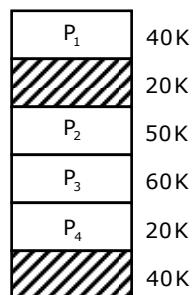
(D) $\begin{bmatrix} 6 \\ 3 \\ 3 \end{bmatrix}$

36. Which of the following graph is Euler?



37. There are 12 intermediate stations between places A and B. In how many ways can a train made to stop at 4 times of 12 intermediate stations such that no two stopping's are consecutive?
- (A) 9P_4 (B) 9C_3 (C) 9P_5 (D) 9P_3

38. In a simple graph G with 'n' vertices and k-components maximum number of edges in G is
 (A) $\left(\frac{n}{2}\right)$ (B) $\left(\frac{n}{2}\right) - k$ (C) $\left(\frac{n}{2}\right) + k$ (D) $\frac{(n-k)(n-k+1)}{2}$
39. The minimum number of edges in a connected cycle graph on 'n' vertices is
 (A) $n - 1$ (B) n
 (C) $n + 1$ (D) None of these
40. A full m-ary tree is a m-ary tree where within each level every node has either 0 or m children. For full m-ary tree of height h has l leaves with
 (A) $l < m^h$ (B) $l \leq m^h$ (C) $l > m^h$ (D) $l \geq m^h$
41. A priority queue is implemented as a max heap. Initially the level order traversal of S elements of heap is
 70, 50, 30, 20, 10
 The new elements 3, 49 are inserted in heap, the level order traversal after insertion is
 (A) 70,50,49,30,20,10,3 (B) 70,50,49,3,10,20,30
 (C) 70,50,49,10,20,3,30 (D) 70,50,49,20,10,3,30
42. A demand-paging uses a TLB (Translation Look-aside Buffer) and single level page table stored in main memory. The memory access time is $5 \mu s$ and the page fault service time is 25 ms. If 70% of access are in TLB and of the remaining, 20% is not present in main memory. The effective memory access time in ms is _____
43. Consider the following instance of memory system.
 Following allocation is suffering from external fragmentation of 60 K Bytes.



The amount of memory that must be moved in order to get an efficient compacted memory in K bytes is _____.

44. Consider the following relation R(ABCDEF) with FD set

$A \rightarrow BCDEF$

$BC \rightarrow ADEF$

$B \rightarrow F$

$D \rightarrow E$

The highest normal form achieved by R is

- (A) 1NF (B) 2NF (C) 3NF (D) BCNF
45. Consider the following table

Orders

Order_Id	Order_price	Customer
1	500	Rajesh
2	300	Ramesh
3	100	Suresh
4	600	Rajesh
5	800	Rajesh
6	900	Suresh
7	400	Rakesh

The number of tuples if we execute the following query on the above table is_____.

Select Customer, Sum(order_price)

From Orders

Group by Customer

Having Sum(order_price) < = 1000

46. Suppose a schedule with two transactions T_1 and T_2

T_1	T_2
read(A)	
write(A)	
	read(A) commit
read(A) abort	

The above schedule is

- (A) Cascade-less schedule (B) Recoverable schedule
(C) Irrecoverable schedule (D) None of these

47. The instruction set of instruction execution speed of a machine is as follow

Instruction	Speed	Frequency%
ADD	8	30
SHIFT	4	20
LOAD	12	30
STORE	12	20

If the clock frequency is 2.3 GHz, then the machine performance in MIPS is _____

Common Data Questions: 48 & 49

List of keys (k) = 6,17,23,34, 48, 99 are inserted into the hash table by using hash function $H=k \bmod \text{table size}$ and table size is 10. For resolving collisions linear probing is used.

48. Number of collisions occurred when we insert new element '103' is _____.

List of keys (k) = 6,17,23,34, 48, 99 are inserted into the hash table by using hash function $H=k \bmod \text{table size}$ and table size is 10. For resolving collisions linear probing is used.

49. After inserting element '103', a new element 333 is inserted. The number of collisions occurred when we insert element 333 is _____.

Common Data Questions: 50 & 51

A moving arm disk-storage device has the following specifications.

Number of tracks per recording surface -200

Disk – rotation speed – 2400 rpm

Track storage capacity – 62,500bits

50. What is the data transfer rate for this device?
- (A) 6150k bytes/sec (B) 31.25k bytes /sec
- (C) 312.5k bytes/sec (D) None of these

A moving arm disk-storage device has the following specifications.

Number of tracks per recording surface -200

Disk – rotation speed – 2400 rpm

Track storage capacity – 62,500bits

51. What is the average number of sectors possible in each track when sector control information takes four Bytes and data area is formatted to 256 bytes?
(A) 30sectors (B) 29sectors (C) 32sectors (D) 31sectors

Linked Answer Questions: Q.52 to Q.55 Carry Two Marks Each

Statement for Linked Answer Questions: 52 & 53

Consider the following grammar:

$S \rightarrow aBA$

$A \rightarrow aAE / E$

$B \rightarrow bBC / b$

$C \rightarrow cCD / D$

$D \rightarrow aDC$

$E \rightarrow ED / eE / e$

$F \rightarrow SeF$

52. Find out the number of useless symbols in the grammar.

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

Consider the following grammar:

$S \rightarrow aBA$

$A \rightarrow aAE / E$

$B \rightarrow bBC / b$

$C \rightarrow cCD / D$

$D \rightarrow aDC$

$E \rightarrow ED / eE / e$

$F \rightarrow SeF$

53. After removal of useless symbols, how many productions violate the rules of greibach normal form?

(A) 0 (B) 1 (C) 2 (D) 3

Statement for Linked Answer Questions: 54 & 55

An instruction requires four stages to execute:

Stage 1 (instruction fetch) requires 40 ns

Stage 2 (instruction decode) requires 10 ns

Stage 3 (instruction execute) requires 25 ns and

Stage 4 (store results) requires 15 ns.

54. If an instruction must proceed through these stages in sequence, what is the minimum asynchronous time for any single instruction to complete?
- (A) 40ns (B) 10ns (C) 45ns (D) 90ns

An instruction requires four stages to execute:

Stage 1 (instruction fetch) requires 40 ns

Stage 2 (instruction decode) requires 10 ns

Stage 3 (instruction execute) requires 25 ns and

Stage 4 (store results) requires 15 ns.

55. If we want to set this up as a pipelined operation what is the speedup of the pipeline achieved?
- (A) 1.5 (B) 2.25 (C) 2.75 (D) 3.5

Q. No. 56 – 60 Carry One Mark Each

Spot the error part of the sentences given below:

56. Rajesh is/ smarter enough/ to get selected for his post/ without any
A B C D
recommendations
- (A) Rajesh is
(B) Smarter enough
(C) To get selected for his post
(D) Without any recommendations

Choose the appropriate antonym for the given word given below:

57. Prosaic
(A) pacified (B) pensive (C) imaginative (D) indulge

Choose the odd one out:

58. (A) Steel (B) Copper (C) Bronze (D) Brass

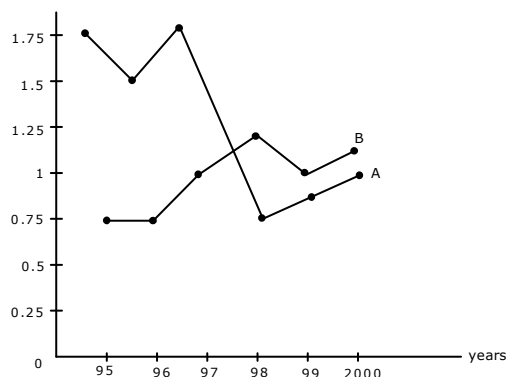
Choose a pair that has most similar relationship to the given pair:

59. Sky: Fly
(A) Cry: Fry (B) Boat: Swim
(C) Run: Shirt (D) Dig: Rat
60. In a class of 30 students, Atul's rank is eight from the top. Madhu is five ranks below Atul. What is Madhu's rank from bottom?
(A) 17 (B) 16 (C) 19 (D) 18

Q. No. 61 – 65 Carry Two Marks Each

61. "Students who hired a hack to write their projects were punished"
Choose the best assumption for the given statement:
(A) Students have become mischievous
(B) Hack's are intelligent
(C) Hiring a hack is inexpensive
(D) Students have projects to be done
62. The total age of some 7 years old and some 5 years old children is 60 years, if I have to select a team from these children such that their total age is 48 years. In how many ways it can be done?
(A) 4 (B) 25 (C) 3 (D) 1
63. 6 litres are drawn from a container full of milk and is then filled with water. This operation is performed two more times. The ratio of the quantity of milk now left in container to that of water is 27: 37. How much milk did the container hold originally?
(A) 32 (B) 42 (C) 24 (D) 28
64. A 3-digit number '4 a 3' is added to another 3- digit number '9 8 4' to give a 4-digit number 13b7 which is divisible by 11. Then $(b - a)(b + a) = ?$
(A) 72 (B) 90 (C) 80 (D) 180

65. Ratio of exports to imports (in terms of money (Rs. in crores) of two companies over years?



If imports of company A in 1997 were increased by 40% what would be ratio of export to increased imports?

- (A) 5 : 4 (B) 4 : 5 (C) 2 : 3 (D) 3 : 4