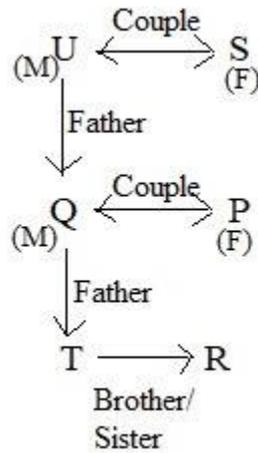


BEL

Computer Science & IT

Sample Mock Test - 2

Questions with detailed Solution



Persons	Professions
P	Nurse
Q	Doctor
R	Student
S	Housewife
T	Student
U	Contractor

Here, we don't know the gender of T and R. So, data is inadequate.

4. A person is walking at a speed of 6 km/hr along a railway track. If he is 200 m ahead of the train which is 100 m long and runs at a speed of 60 km/hr in same direction, then what is the time required to pass the person?

- A. 5 sec
- B. 10 sec
- C. 15 sec
- D. 20 sec

Ans. D

Sol. **Given:** Speed of the person = 6 km/hr, length of train = 100 m, speed of train = 60 km/hr
 Speed of train relative to walking person = (60 - 6) = 54 km/hr

Convert km/hr into m/s:

$$54 \text{ km/hr} = 54 \times \frac{5}{18} = 15 \text{ m/s}$$

Distance to be covered by the train = 200 + 100 = 300 m

Therefore, time taken by the train to cross the person:

$$\frac{\text{Distance}}{\text{Speed}} = \frac{300}{15} \text{ sec} = 20 \text{ sec}$$

5. A boatman rows 2 km in 8 minutes, along the stream and 6 km in 1 hour against the stream.

The speed of the stream is:

- A. 3.5 kmph
- B. 3 kmph
- C. 4.5 kmph
- D. 2 kmph

Ans. C

Sol. Speed of downstream (x) = $\frac{2}{8} \times 60 = 15 \text{ kmph}$

Speed of upstream (y) = 6 kmph

$$\therefore \text{speed of current} = \frac{1}{2}(x - y) = \frac{1}{2}(15 - 6) = \frac{9}{2} = 4.5 \text{ kmph}$$

Option C is correct.

6. A man crosses a 400 m long bridge in 8 minutes. What is his speed in km/h?

- A. 3 km/h
- B. 50 km/h
- C. 20 km/h
- D. 6 km/h

Ans. A

Sol. Speed = (Distance)/Time = 400/8 = 50 m/min

Speed in km/h = 50 × (60/1000) = 3 km/h

7.If $(21x - 25y) : (4x + 5y) = 5 : 4$, then one of the value of $\frac{\sqrt[3]{x} + \sqrt[3]{y}}{\sqrt[3]{x} - \sqrt[3]{y}}$ is.

- A. 6.5
- B. 10
- C. 8
- D. 9

Ans. D

Sol. Given that -

$$\frac{21x - 25y}{4x + 5y} = \frac{5}{4}$$

$$4 \times (21x - 25y) = 5 \times (4x + 5y)$$

$$84x - 100y = 20x + 25y$$

$$64x = 125y$$

$$x/y = 125/64$$

$$(x/y)^{\frac{1}{3}} = \frac{5}{4}$$

$$\frac{\sqrt[3]{x} + \sqrt[3]{y}}{\sqrt[3]{x} - \sqrt[3]{y}} = \left[\frac{\sqrt[3]{x} \left(1 + \sqrt[3]{\frac{y}{x}} \right)}{\sqrt[3]{x} \left(1 - \sqrt[3]{\frac{y}{x}} \right)} \right]$$

$$= \left(\frac{1 + \frac{4}{5}}{1 - \frac{4}{5}} \right)$$

$$= \frac{9/5}{1/5}$$

$$= 9.$$

8. What number should be subtracted from $x^3 + 4x^2 - 7x + 12$, so that it will be completely divisible by $(x+3)$?

- A. 24
- B. 39
- C. 42
- D. 37

Ans. C

Sol. Let the required number is k. Then, $x^3+4x^2-7x+12-k$ will be divisible by $x+3$

$$\Rightarrow (-3)^3+4(-3)^2-7(-3)+12-k=0$$

$$\Rightarrow -27+36+21+12-k=0$$

$$\Rightarrow k=42$$

9. A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?

A. 34

B. 40

C. 68

D. 88

Ans. D

Sol. one side of rectangle= 20 and area= 680

so, other side be $680/20=34$

total side to be fenced= $34+34+20= 88$ feet

10. If the difference between a number and $1/5^{\text{th}}$ of it is 84, what is the number?

A. 115

B. 95

C. 105

D. 125

Ans. C

Sol. Let the number be x

$$x-x/5=84$$

$$4x/5=84$$

$$x=84 \times 5/4$$

$$x=105$$

11. Find the missing series

13, 21, 48, 112, ?

A. 237

B. 280

C. 255

D. 290

Ans. A

Sol. The given sequence are:

13, 21, 48, 112, ?

To find, the value of missing number =

The pattern follow:

Previous number $+2^3$, Previous number $+3^3$, Previous number $+4^3$, Previous number $+5^3...$,

$$21=13+2^3=13+8=21$$

$$48=21+3^3=21+27=48$$

$$112=48+4^3=48+64=112$$

Similarly,

$$? = 112 + 5^3 = 112 + 125 = 237$$

The value of the missing number = 237

Hence, the value of "the missing number is equal to 237.

12. If the first two digits of each number are interchanged then the numbers are arranged in increasing order from left to right then which of the following numbers in the newly formed sequence will be second from right end?

- A. 563
- B. 218
- C. 732
- D. 491

Ans. A

Sol. The given sequence:

563 218 732 491 924

Interchanging first two digits of each number, we get:

653 128 372 941 294

Arranging the numbers in increasing order from left to right, we get:

128 294 372 653 941

Here, the second number from right end in the newly formed sequence is 653.

13. Two trains A and B of 150 m and 300 m, run at speed of 54 km/hr and 108 km/hr respectively, in the direction opposite direction to each other. Find the time required to cross each other after the moment they met?

- A. 10 sec
- B. 11 sec
- C. 12 sec
- D. 13 sec

Ans. A

Sol. Length of train A = 150 m, speed = 54 km/hr

Length of train B = 300 m, speed = 108 km/hr

1) Convert km/hr into m/s:

$$54\text{Km / hr} = 54 \times \frac{5}{18} = 15 \text{ m / s}$$

$$108\text{Km / hr} = 108 \times \frac{5}{18} = 30 \text{ m / s}$$

2) As both trains move opposite to each other, relative speed = 15 + 30 m/s = 45 m/s

Distance = (Length of train A + Length of train B) = (150 + 300) = 450 m

We know,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Time} = \frac{450}{45\text{sec}} = 10 \text{ sec}$$

18. Direction: Have a word followed by four answer choices. You will choose the word that is a necessary part of the word.

oligopoly

A. corrupt

B. gigantic

C. market

D. rich

Ans. C

Sol. oligopoly is a market form where market is dominated by small no of sellers.

19. A vendor sells 50 percent of apples he had and throws away 20 percent of the remainder. Next day he sells 60 percent of the remainder and throws away the rest. What percent of his apples does the vendor throw?

A. 26%

B. 23%

C. 25%

D. 27%

Ans. A

Sol. Let total apples be 100

first day he throws = $50 \times 20 / 100 = 10$ apples

next day he throws = $40 \times 40 / 100 = 16$ apples

so total = 26

20. The sum of ages of 5 children born at the intervals of 3 years is 50 years. What is the age of the youngest child?

A. 4 years

B. 8 years

C. 10 years

D. None of these

Ans. A

Sol. Let the ages of children be $x, (x + 3), (x + 6), (x + 9)$ and $(x + 12)$ years.

Then, $x + (x + 3) + (x + 6) + (x + 9) + (x + 12) = 50$

$5x = 20$

$x = 4.$

Age of the youngest child = $x = 4$ years.

21. The average daily rainfall of town A is 105 for first 2 days of the week, 84 for next 3 days and 49 for the last 2 days of the week. The total weekly rainfall for town B is 455. What will be the average daily rainfall of both the towns together?

A. 138

B. 152

C. 159

D. 145

Ans. D

Sol. Total weekly rainfall for town A = $2 \times 105 + 3 \times 84 + 2 \times 49$

= $210 + 252 + 98 = 560$

Total weekly rainfall for town A and B = $560 + 455 = 1015$

Average daily rainfall of both the towns together

$$= \frac{\text{Total weekly rainfall of both the towns together}}{7} = \frac{1015}{7} = 145$$

22. A man crosses a 400 m long bridge in 8 minutes. What is his speed in km/h?

- A. 3 km/h
- B. 50 km/h
- C. 20 km/h
- D. 6 km/h

Ans. A

Sol. Speed = (Distance)/Time = 400/8 = 50 m/min
 Speed in km/h = 50 × (60/1000) = 3 km/h

23. A can complete a piece of work in 20 days and B can complete 20% of the work in 6 days. If they work together in how many days can they finish 50% of the work, if they work together?

- A. 12
- B. 6
- C. 8
- D. 9

Ans. B

Sol. Let us suppose that A can do 100 units of work in 20 days
 Then B will complete 20 units of work in 6 days.

Then A's 1 unit = $\frac{20}{100} = \frac{1}{5}$ day

And B's 1 unit = $\frac{6}{20} = \frac{3}{10}$ days

50% of work will be completed in:

A = 50 units = $\frac{1}{5} \times 50 = 10$ days

B = 50 units = $\frac{3}{10} \times 50 = 15$ days

Together they can complete the work in $\frac{xy}{x+y}$ days

$\Rightarrow \frac{15 \times 10}{15 + 10} = \frac{150}{25} = 6$ days

24. The average of three numbers a, b and c is 2 more than c. The average of a and b is 48. If d is 10 less than c, then the average of c and d is:

- A. 50
- B. 35
- C. 36
- D. 40

Ans. D

Sol. Given: a + b = 2 × 48 = 96

And $\frac{a+b+c}{3} = c + 2$

$\Rightarrow a + b + c = 3c + 6$

x=300

28. When the sum of all possible two-digit numbers formed from three different one-digit natural numbers are divided by sum of the original three numbers, the result is:
- A. 26
 - B. 24
 - C. 20
 - D. 22

Ans. D

Sol. Let x,y, z is original three digits, then possible number of two digits number are

All possible Numerators are :

(10*x)+y

(10*x)+z

(10*y)+x

(10*y)+z

(10*z)+x

(10*x)+y

Sum of all these two numbers are $2*(x+y+z)*10+2*(x+y+z)$

According to qn, $\frac{2*(x+y+z)*10+2*(x+y+z)}{x+y+z} = 22$

29. A, B, N, C, D, O, E, F, P, ?, ?, ?
- A. G, H, I
 - B. G, H, J
 - C. G, H, Q
 - D. J, K, L

Ans. C

Sol. The series consists of 2 groups (A, B, C, D, E, F, ?, ?) and (N, O, P, ?). The series is made of two terms of first group followed by one term of second group.

30. Find the missing series:
 BXM, EUP, HRS,?
- A. XZY
 - B. RPN
 - C. VTU
 - D. KOV

Ans. D

Sol. The pattern is as follows,

B + 3 = E + 3 = H + 3 = K

X - 3 = U - 3 = R - 3 = O

M + 3 = P + 3 = S + 3 = V

So, the missing series is KOV.

31. Which of the following sorting algorithms does not have a worst-case running time of $O(n^2)$?
- A. Insertion sort
 - B. Merge sort

C. Quicksort

D. Bubble sort

Ans. B

Sol.

		Best Case	Average Case	Worst Case
A	Insertion Sort	$O(N)$	$O(N^2)$	$O(N^2)$
B	Merge sort	$O(N \log N)$	$O(N \log N)$	$O(N \log N)$
C	Quick Sort	$O(N \log N)$	$O(N \log N)$	$O(N^2)$
D	Bubble Sort	$O(N)$	$O(N^2)$	$O(N^2)$

32. The Average case occurs in the linear search algorithm

A. when the item is somewhere in the middle of the array

B. when the item is not the array at all

C. when the item is the last element in the array

D. Item is the last element in the array or item is not there at all

Ans. A

Sol. The Average case occurs in the linear search algorithm when the item is somewhere in the middle of the array

33. If the array A contains the items 10, 4, 7, 23, 67, 12 and 5 in that order, what will be the resultant array A after third pass of insertion sort?

A. 67, 12, 10, 5, 4, 7, 23

B. 4, 7, 10, 23, 67, 12, 5

C. 4, 5, 7, 67, 10, 12, 23

D. 10, 7, 4, 67, 23, 12, 5

Ans. B

Sol. Given: 10,4,7,23,67,12,5

Pass 1 will be applied on first 2 elements.

10,4 | ,7,23,67,12,5

Pass 1: 4,10 | , 7 ,23,67,12,5

Pass 2: 4, 7, 10 | , 23,67,12,5

Pass 3: 4, 7, 10, 23 | , 67,12,5

34. Match with the suitable one:

List-I

A) Multicast group membership

B) Interior gateway protocol

C) Exterior gateway protocol

D) RIP

List-II

1. Distance vector routing

2. IGMP

3. OSPF

4. BGP

A. A-2, B-3, C-4, D-1

B. A-2, B-4, C-3, D-1

C. A-3, B-4, C-1, D-2

D. A-3, B-1, C-4, D-2

Ans. A

Sol. IGMP→ Multicast group membership

OSPF→ Interior gateway protocol

BGP→ Exterior gateway protocol

Distance vector routing→ RIP

35. Which of the following are characteristics of packet switching?

A. Bandwidth divided, store and forward, good for bursty data

B. Bandwidth shared, queues at routers, different paths possible

C. Bandwidth shared, low transmission delay, routes may change during transmission

D. Bandwidth divided, translation tables for routing, destination address field in packet.

Ans. B

Sol. Packet switching is a connectionless network switching technique. Here, the message is divided and grouped into a number of units called packets that are individually routed from the source to the destination. There is no need to establish a dedicated circuit for communication. Therefore, it has bandwidth shared, queues at routers, different paths possible.

36. Which of the following is true?

A. ICMP error message generated only for the first fragment.

B. Distance vector is inter domain protocol.

C. Link state routing uses Bellman Ford algorithm to compute distance.

D. OSPF is inter domain protocol.

Ans. A

Sol. ICMP error message generated only for the first fragment.

Distance vector is intra domain protocol, LSR uses Dijkstra's algorithm.

OSPF is intra domain protocol based on link state routing.

So option (a) is correct.

37. Which of the following can be used during DMA transfer by Central Processing Unit?

A. Memory

B. CPU register

C. System bus

D. None of these

Ans. B

Sol. Direct memory access (DMA) is a feature of computer systems that allows certain hardware subsystems (keyboard etc.) to access Main Memory (RAM), independent of the central processing unit (CPU).

During DMA transfer, only CPU register is used while system bus and memory cannot be used by CPU.

38. The multiplier is stored in _____
- A. PC Register
 - B. Shift register
 - C. Cache
 - D. None of the above

Ans. B

Sol. The value is stored in a shift register so that each bit can be accessed separately.

39. The technique whereby the DMA controller steals the access cycles of the processor to operate is called _____
- A. Fast conning
 - B. Memory Controller
 - C. Cycle stealing
 - D. Memory stealing

Ans. C

Sol. The controller takes over the processor's access cycles and performs memory operations. In computing, traditionally **cycle stealing** is a method of accessing computer memory (RAM) or bus without interfering with the CPU. It is similar to direct memory access (DMA) for allowing I/O controllers to read or write RAM without CPU intervention.

40. 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. address of

Ans. C

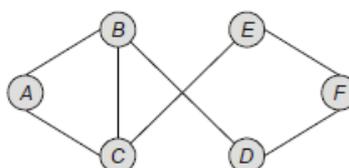
Sol. Array element access has left to right associativity in C++.

41. What data structure is used for depth first traversal of a graph?
- A. Queue
 - B. Stack
 - C. List
 - D. None of above

Ans. B

Sol. DFS uses stack data structure. Depth First Search (DFS) algorithm traverses a graph in a deathward motion and uses a stack to remember to get the next vertex to start a search, when a dead end occurs in any iteration.

42. Assume breadth first search algorithm has been implemented using the queue data structure on given graph :



Which of the following is possible order of visiting the nodes using BFS algorithm?

- A. ACBDEF
- B. ECFDBA
- C. CBAEDF
- D. BDCAEF

Ans. C

Sol. Considering each of the order,

ACBDEF- Since vertex C is traversed before vertex B, hence vertex E will be traversed before vertex D.

ECFDBA- Since vertex C is traversed before vertex F, hence F can't traverse before vertex A and B.

BDCAEF- Since vertex D is traversed before vertex C, hence F should be traversed before vertex E.

43. Which of the following is not valid Boolean algebra rule?

- A. $X.X = X$
- B. $(X + Y).X = X$
- C. $X' + XY = Y$
- D. $(X + Y).(X + Z) = X + YZ$

Ans. C

Sol. i) $X.X = X$

$$\begin{aligned} \text{ii) } & (X + Y).X \\ &= X.X + X.Y \\ &= X + X.Y \\ &= X(1 + Y) \\ &= X \end{aligned}$$

$$\begin{aligned} \text{iii) } & X' + XY \\ &= (X' + X)(X' + Y) \\ &= (1)(X' + Y) \\ &= (X' + Y) \end{aligned}$$

$$\begin{aligned} \text{iv) } & (X + Y).(X + Z) \\ &= X.X + X.Z + X.Y + Y.Z \\ &= X(1 + Z + Y) + Y.Z \\ &= X + Y.Z \end{aligned}$$

44.

		CD			
		00	01	11	10
AB	00	X	1		1
	01				
	11				
	10	X	1	1	X

What will be the equation of simplification of the given K-Map?

- A. $A B' + B' C D' + A' B' C'$
- B. $A B' + A' B' D' + A' B' C'$
- C. $B' D' + AB' + B'C'$
- D. $B'D' + A' B'C + A B'$

Ans. C

Sol.

	CD			
AB	00	01	11	10
00	x	1		1
01				
11				1
10	x	1	1	1

$$= \bar{B}\bar{D} + AB' + \bar{B}\bar{C}$$

45. Consider the following Boolean function of four variables, $f(w, x, y, z) = \Sigma(1, 3, 4, 6, 9, 11, 12, 14]$, the function is?

- A. Independent of one variable
- B. Independent of two variables
- C. Independent of three variables
- D. Dependent on all variables

Ans. B

Sol. The K-Map for the Boolean function of four variables can be drawn as:

	YZ				
WX	00	01	11	10	
00		1	1		↗ XZ'
01	1			1	
11	1			1	
10		1	1		↘ X'Z

So, independent of two variables.

46. A machine produces 0, 1 or 2 defective pieces in a day with associated probability of 1/6, 2/3 and 1/6, respectively. The mean value and the variance of the number of defective pieces produced by the machine in a day, respectively, are

- A. 1 & 1/3
- B. 1/3 & 1
- C. 1 & 4/3
- D. 1/3 & 4/3

Ans. A

Sol. Mean (μ) = $E(x) = \sum x \times P(x)$

$$= \left(0 \times \frac{1}{6} + 1 \times \frac{2}{3} + 2 \times \frac{1}{6} \right) = 1$$

$$E(x^2) = \sum x^2 P(x)$$

$$= \left(0 \times \frac{1}{6} + 1 \times \frac{2}{3} + 4 \times \frac{1}{6} \right) = \frac{4}{3}$$

$$\text{Variance} = E(x^2) - \mu$$

$$= \frac{4}{3} - 1 = \frac{1}{3}$$

47. Let probabilities of solving a problem by students x,y,z are 1/3,1/4,1/5 respectively. What is the probability that problem is solved by exactly one student?

- A. 1/3
- B. 13/30
- C. 3/5
- D. 1/2

Ans. B

Sol. $P[\text{problem is solved by exactly one}] = P[x.y'.z'] + P[x'.y.z'] + P[x'.y'.z]$

$$= (1/3).(3/4).(4/5) + (2/3).(1/4).(4/5) + (2/3).(3/4).(1/5) = 13/30$$

48. Which of the following is the recurrence relation for insertion sort?

- A. $T(n) = T(n-1) + O(n)$
- B. $T(n) = T(n/2) + O(n)$
- C. $T(n) = T(n^2) + O(\log n)$
- D. $T(n) = T(n^2) + O(n \log n)$

Ans. A

Sol. Insertion sort is a sorting algorithm in which the elements are transferred one at a time to the right position. In other words, an insertion sort helps in building the final sorted list, one item at a time, with the movement of higher-ranked elements.

The recursively sort $A[1..n-1]$ part takes $T(n-1)$ time, while the insert $A[n]$ into the sorted array $A[1..n-1]$ part takes $O(n)$ time. Add them together to get $T(n) = T(n-1) + O(n)$.

49. How many passes does a Bubbles sort algorithm require for sorting a given list of 'n' items?

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

Ans. D

Sol. Bubble sort is implemented using sorting two element at a time \rightarrow bubble is a simple sorting algorithm that works by repeatedly stepping through the list to be sorted, comparing each pair of adjacent items swapping them if they are in wrong order,

NOTE- Regardless of how the items are arranged in the initial list, $n-1$ passes will be made to sort a list of size n .

Comparisons for Each Pass of Bubble Sort	
Pass	Comparisons
1	$n-1$
2	$n-2$
3	$n-3$
...	...
$n-1$	1

50. Selection sort algorithm design technique is an example of
- A. Greedy method
 - B. Divide-and-conquer
 - C. Dynamic Programming
 - D. Backtracking

Ans. A

Sol. The selection sort algorithm sorts an array by repeatedly finding the minimum element (considering ascending order) from unsorted part and putting it at the beginning. The algorithm maintains two subarrays in a given array.

- 1) The subarray which is already sorted.
- 2) Remaining subarray which is unsorted.

In every iteration of selection sort, the minimum element (considering ascending order) from the unsorted subarray is picked and moved to the sorted subarray. Clearly, it is a greedy approach to sort the array.

Option A. is correct.

51. Which of the following statement is true?
- A. Bellman ford algo is applied in Distance Vector Routing.
 - B. Count to infinity problem occurs in Distance vector Routing with split Horizon.
 - C. Distance Vector Routing works on OSPF protocol.
 - D. Link State Routing works on Routing Information Protocol.

Ans. A

Sol. Count to infinity problem occurs in Distance vector Routing without split horizon. Distance Vector Routing works on Routing Information Protocol. Link State Routing works on OSPF protocol.

52. In link state routing, after the construction of link state packets new routes are computed using
- A. Bellman Ford algorithm
 - B. DES algorithm
 - C. Dijkstra's algorithm
 - D. Leaky bucket algorithm

Ans. C

Sol. Link state routing is a technique in which each router shares the knowledge of its neighborhood with every other router in the internetwork. Each node uses Dijkstra's algorithm on the graph to calculate the optimal routes to all nodes.

o The Link state routing algorithm is also known as Dijkstra's algorithm which is used to find the shortest path from one node to every other node in the network.

o The Dijkstra's algorithm is an iterative, and it has the property that after k^{th} iteration of the algorithm, the least cost paths are well known for k destination nodes.

53. When a host on network A sends a message to a host on network B, which address does the router look at?

- A. Port
- B. IP
- C. Physical
- D. Subnet mask

Ans. B

Sol. Routing is done on the basis of IP addresses. A host on network A when sends the packet to the host on network B, it checks the IP address of the receiving host and routes the packet to the suitable hop.

Physical address i.e. the MAC address is used to recognize a unique host over a network on in a LAN.

Port number is required to identify a specific process or application to which a message is to be forwarded when it arrives at a server.

54. Which most popular input device is used today for interactive processing and for the one line entry of data for batch processing?

- A. Mouse
- B. Magnetic disk
- C. Visual display terminal
- D. Card punch

Ans. A

Sol. In batch processing systems the processes are grouped into batches and they're executed in batches.

55. The register that stores all interrupt requests is:

- A. Interrupt mask register
- B. Interrupt service register
- C. Interrupt request register
- D. Status register

Ans. C

Sol. * The register that stores all interrupt requests is Interrupt request register.

* Interrupt mask register is a read and write register. This register enables or masks interrupts from being triggered on the external pins of the Cache Controller.

* Interrupt service register handle the interrupt and service them according to priority and other condition.

* Status register is a hardware register that contains information about the state of the processor

56. Consider a 33 MHz CPU based system. What is the number of wait states required if it is interfaced with a 60 ns memory? Assume a maximum of 10 ns delay for additional circuitry like buffering and decoding.

- A. 0
- B. 1
- C. 2
- D. 3

Ans. D

Sol. A wait state is a delay experienced by a computer processor when accessing external memory or another device that is slow to respond.

Total memory access time = 60 ns + 10 ns = 70 ns.

Given, CPU frequency = 33 MHz

So,

1 clock time = $1 / (33 \text{ MHz}) = (1/33) * 10^{-6} = 30.30 \text{ ns}$.

Therefore,

Total number of wait states = Total number of cycle needed = $70 \text{ ns} / (30.30 \text{ ns}) = 2.31 \approx 3$ cycles.

57. Which of the following is correct output for the program code given below?

```
main ( )
{
    void fun ( );
    fun( );
    fun( );
}
void fun ( );
{
    static int i = 1;
    auto int j = 5;
    printf ("%d", (i++));
    printf ("%d", (j++));
}
```

- A. 1 5 2 6 3 7
- B. 2 6 3 7 4 8
- C. 1 5 2 5
- D. 1 5 2 5 3 5

Ans. C

Sol. An object whose storage class is auto, is reinitialized at every function call whereas an object whose storage class static persist its value between different function calls.

When the function fun () is called for the first time, values of i and j are printed and sequentially incremented. During the second function call, i retains its incremented value whereas j is reinitialized, hence i will print 2 and j will print 5 again.

58. What data structure would you choose to implement "undo" feature in a word processor?

- A. Queue
- B. Dequeue
- C. Stack
- D. None of the above

Ans. C

Sol. Stack is most suitable data structure since it works in LIFO ordering. All the actions are pushed into stack and whatever action has to be reversed (undo) can be just popped off the top of stack.

59. Which of the following tree traversal technique is not based on depth first search?

- A. Preorder traversal
- B. Level order traversal
- C. Postorder traversal
- D. Inorder traversal

Ans. B

Sol. Level order traversal also known as breadth first search while other three are depth first search.

60. The characteristic equation of an SR flip-flop is given by

- A. $Q_{n+1} = S + RQ_n$
- B. $Q_{n+1} = RQ'_n + SQ_n$
- C. $Q_{n+1} = S' + RQ_n$
- D. $Q_{n+1} = S + R'Q_n$

Ans. D

Sol. The characteristic table of an SR flip-flop is:

TRUTH TABLE

S	R	Q_n	Q_{n+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	-
1	1	1	-

So, by simplifying using k-maps:

characteristic equation of an SR flip-flop = $Q_{n+1} = S + R'Q_n$

Option d is correct.

61. How many Addition and Subtraction are required if you perform multiplication of 5 (Multiplicand) and -30 (Multiplier) using Booth Algorithm?

- A. 2, 1
- B. 1, 2
- C. 1, 1
- D. 2, 2

Ans. D

Sol. Multiplicand -

Decimal: 5

Binary: 00000101

Decimal: -30

Binary: 11100010

Two's Complement: 00011110

Steps -

Starting Out: 000000000000101

Subtract: 0001111000000101

Shift: 0000111100000010

Add: 1111000100000010

Shift: 1111100010000001

Subtract: 0001011010000001

Shift: 0000101101000000

Add: 1110110101000000

Shift: 1111011010100000

Shift: 1111101101010000

Shift: 1111110110101000

Shift: 1111111011010100

Shift: 1111111101101010

Final Product (Binary): 1111111101101010

Final Product (Decimal): -150

2 subtraction, 2 addition

62. The Boolean function $Y(A,B,C) = A\bar{B} + A \oplus C$. The SOP and POS form will be?
- A. $Y = \Sigma(1, 2, 3, 6, 7)$ and $Y = \Pi(0, 4, 5)$
 - B. $Y = \Sigma(1, 3, 4, 5, 6)$ and $Y = \Pi(0, 2, 7)$
 - C. $Y = \Sigma(0, 2, 5, 6)$ and $Y = \Pi(1, 3, 4, 7)$
 - D. None of these

Ans. B

Sol. $Y = A\bar{B} + A \oplus C$
 $= A\bar{B} + A\bar{C} + \bar{A}C$

So,

SOP = $\Sigma_m(1, 3, 4, 5, 6)$

POS = $\Pi(0, 2, 7)$

63. What is the probability of getting a sum of 9 from two throws of a dice?
- A. 1/6
 - B. 1/8
 - C. 1/9
 - D. 1/12

Ans. C

Sol. Favourable outcomes = $\{ (6,3), (3,6), (5,4), (4,5) \}$

Total possible outcomes = 36

Probability = $4/36 = 1/9$

Sol. A stealth virus is a hidden computer virus that attacks operating system processes and averts typical anti-virus or anti-malware scans. Stealth viruses hide in files, partitions and boot sectors and are adept at deliberately avoiding detection.

68. Which of the following is NOT true of deadlock prevention and deadlock avoidance schemes?
- A. In deadlock prevention, the request for resources is always granted if the resulting state is safe
 - B. In deadlock avoidance, the request for resources is always granted if the result state is safe
 - C. Deadlock avoidance is less restrictive than deadlock prevention
 - D. Deadlock avoidance requires knowledge of resource requirements a priori

Ans. A

Sol. Deadlock Prevention: Deadlocks can be prevented by preventing at least one of the four required- Mutual Exclusion, Hold and Wait, No Pre-emption, Circular Wait.

Option A *In deadlock prevention, the request for resources is always granted if the resulting state is safe. false,* Deadlock prevention scheme handles deadlock by making sure that one of the four necessary conditions don't occur. In deadlock prevention, the request for a resource may not be granted even if the resulting state is safe.

Option B *In deadlock avoidance, the request for resources is always granted if the result state is safe. true,* As in Deadlock avoidance, if resultant state is safe than request for resource is granted as being in a safe state, it can hold other resources now.

Option C *Deadlock avoidance is less restrictive than deadlock prevention. true,* As in Deadlock prevention, request for a resource may not be granted even if the resulting state is safe. but in deadlock avoidance, request for a resource is granted if the resulting state is safe.

Option D *Deadlock avoidance requires knowledge of resource requirements a priori true;* deadlock avoidance checks any chance of deadlock means even if the system is in safe state, it checks that after allocating requested resource, the system is not in deadlocked state. So deadlock avoidance requires knowledge of resource requirements a priori.

69. In dining philosopher problem with 5 philosophers and 6 chopsticks:
- A. Deadlock is possible but not starvation
 - B. Neither Deadlock nor starvation is possible
 - C. No Deadlock but starvation is possible
 - D. Both Deadlock & starvation is possible

Ans. C

Sol. Deadlock never happens in this situation. Starvation to a particular philosopher may happen.

70. Which of the following is true?
- A. Secondary index must be dense
 - B. Clustering index must be dense
 - C. Primary index must be sparse
 - D. Both (a) and (c)

Ans. A

Sol. • Secondary index based on non key. So, must be dense.

- Clustering index based on key may be sparse also so, clustering index may be dense, but not always.
- Primary index on key with non ordering may be dense. So false

71. In the indexed scheme of blocks to a file, the maximum possible size of the file depends on:
A. The number of blocks used for index and the size of index
B. Size of Blocks and size of Address
C. Size of index
D. Size of Block

Ans. A

Sol. In the indexed scheme of blocks to a file, the maximum possible size of the file depends on the number of blocks used for index and the size of index.

72. For a database relation R (a, b, c, d) where the domains of a, b, c and d only include atomic values, only the following functional dependency and those that can be inferred from them hold:
 $a \rightarrow c, b \rightarrow d$
The relation is in?
A. 1NF but not in 2NF
B. 2NF but not in 3NF
C. 3NF
D. None of the above

Ans. A

Sol. Since, it is already mentioned that a, b, c, d are atomic values, so by definition of 1NF, it can be inferred that it is already in 1NF.
But $a \rightarrow c$
 $b \rightarrow d$, the candidate key is $\rightarrow \{ab\}$
So, all the non-key attributes only partially depend on the prime attributes of the candidate key(a and b). So, it is not in 2NF.

73. What will be the equivalent hexadecimal code for $(10111101100)_2$?
A. $5AC_{16}$
B. $5BC_{16}$
C. $5DC_{16}$
D. $5EC_{16}$

Ans. D

Sol. The hexadecimal code for 0101, 1110, 1100 = $5EC_{16}$

74. When two numbers are added in excess-3 code and the sum is less than 9, then in order to get the correct answer it is necessary to?
A. Subtract 0011 from the sum.
B. Add 0011 to the sum.
C. Subtract 0110 from the sum.
D. Add 0110 to the sum.

Ans. A

Sol. The excess-3 binary code is an unweighted self-complementary BCD code. It is an important BCD code, is a 4-bit code and used with BCD numbers. Self-Complementary property means that the 1's complement of an excess-3 number is the excess-3 code of the 9's complement of the corresponding decimal number.

The excess-3 code for 3(0011) is 0110 and to find the excess-3 code of the complement of 3, we just need to find the 1's complement of 0110 -> 1001, which is also the excess-3 code for the 9's complement of 3 -> (9-3) = 6.

75. The number of digit 1 present in the binary representation of

$$3 \times 512 + 7 \times 64 + 5 \times 8 + 3$$

- A. 8
- B. 9
- C. 10
- D. 12

Ans. B

Sol. $3 \times 512 + 7 \times 64 + 5 \times 8 + 3$

$$\begin{aligned} &= (2 + 1) \times 512 + (4 + 2 + 1) \times 64 + (4 + 1) \times 8 + 2 + 1 \\ &= 1024 + 512 + 64 \times 4 + 64 \times 2 + 64 + 32 + 8 + 2 + 1 \\ &= 1024 + 512 + 256 + 128 + 64 + 32 + 8 + 2 + 1 \end{aligned}$$

As 1024 has ten 0's followed by 1, 512 has nine 0's followed by 1 and so on..

So, the expression will contain total nine 1's and will be represented as 11111101011.

Option B. is correct.

76. A complete binary tree with the property that the value at each node is as least as large as the values at its children is known as

- A. binary search tree
- B. AVL tree
- C. completely balanced tree
- D. Heap

Ans. D

Sol. In a Max. Binary Heap, the key value at each node is as least as large as the values at its children. Similarly in Min Binary Heap, the key at root must be minimum among all keys present in Binary Heap.

77. How many distinct binary trees can be constructed with three nodes?

- A. 1
- B. 2
- C. 3
- D. 5

Ans. D

Sol. Number of Distinct binary trees constructed with 3 nodes.

$$= \frac{{}^{2n}C_n}{n+1} = \frac{{}^6C_3}{4} = 5$$

78. The keyword used to transfer control from a function back to the calling function is:

- A. switch
- B. go to
- C. go back
- D. return

Ans. D

Sol. The return statement terminates the execution of a function and it returns the control to the calling function. The execution resumes in the calling function at a point immediately following the call.

79. What is the time complexity of following code:

```
int a = 0;
for (i = 0; i < N; i++)
{
    for (j = N; j > i; j--)
    {
        a = a + i + j;
    }
}
```

- A. $O(N)$
- B. $O(N \cdot \log(N))$
- C. $O(N \cdot \sqrt{N})$
- D. $O(N^2)$

Ans. D

Sol. The above code runs total no of times

$$\begin{aligned} &= N + (N - 1) + (N - 2) + \dots + 1 + 0 \\ &= N * (N + 1) / 2 \\ &= 1/2 * N^2 + 1/2 * N \\ &O(N^2) \text{ times.} \end{aligned}$$

80. Which of the following sorting algorithm does not use recursion?

- A. quick sort
- B. merge sort
- C. heap sort
- D. bottom up merge sort

Ans. D

Sol. Bottom up merge sort uses the iterative method in order to implement sorting. It begins by merging a pair of adjacent array of size 1 each and then merge arrays of size 2 each in the next step and so on.

81. If x is the mean of data 3, x, 2 and 4, then the mode is _____

- A. 1
- B. 2
- C. 3
- D. 4

Ans. C

Sol. $x = \frac{3+x+2+4}{4}$

$4x = 3+x+2+4$

$4x - x = 3+2+4 = 9$

$x = 3$

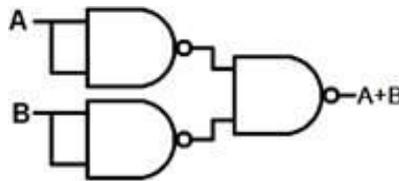
Mode is 3. (Maximum repeated value)

82. What is the minimum number of two-input NAND gates used to perform the function of two input OR gate

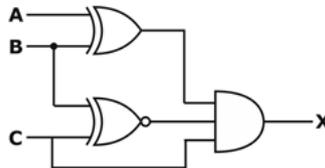
- A. One
- B. Two
- C. Three
- D. Four

Ans. C

Sol. 3 NAND gates are required in minimum to implement an OR gate.



83. For the logic circuit shown in the figure, the required input condition (A, B, C) to make the output X = 1 is



- A. 1, 0, 1
- B. 0, 0, 1
- C. 1, 1, 1
- D. 0, 1, 1

Ans. D

Sol. For X = 1

$A \oplus B = 1$ i.e. A = 0, B = 1

$B \odot C = 1$, i.e. B = 1, C = 1

84. Which of the following scheduling algorithms may cause convoy effect?

- A. Round Robin
- B. First Come First Serve
- C. Shortest Job First
- D. Highest Response Ratio Next

Ans. B

Sol. In convoy effect,

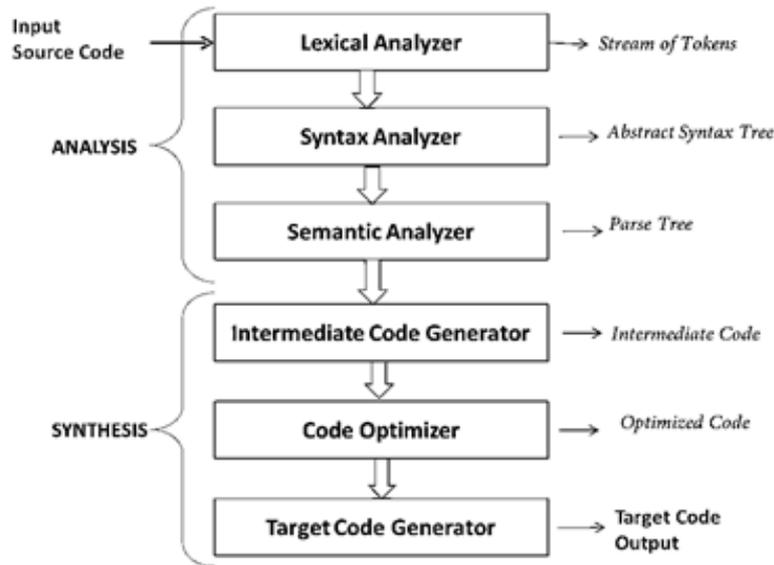
If a processes with higher burst time arrived before the processes with smaller burst time then, smaller processes have to wait for a long time for longer processes to release the CPU. FCFS shows convoy effect under such condition.

85. The output of the lexical analyser is

- A. a set of regular expressions
- B. syntax tree
- C. set of tokens
- D. string of characters

Ans. C

Sol. The output of the lexical analyser is set of tokens.



86. Which of the following is not available in activation record of a procedure?

- A. Actual Parameters
- B. Direct Link
- C. Control Link
- D. Temporaries

Ans. B

Sol. **Actual Parameters:**

The actual parameters used by the calling procedure. Commonly, these values are placed in the activation record but rather in registers, when possible, for greater efficiency. However, space is shown for them to be completely general.

Control Link:

A control link, pointing to the activation record of the caller.

Temporaries:

Temporary values, such as those arising from the evaluation of expressions, in cases where those cannot be held in registers.

Therefore, Direct Link is not present in activation record of procedure.

87. What the checksum is used for?

- A. Error correction
- B. Error detection
- C. Both a & b
- D. None of these

Ans. B

Sol. The checksum is an error detection scheme, in which the data is divided into k segments each of m bits. At the sender's end, the segments are added using 1's complement arithmetic to get the sum. The sum is complemented to get the checksum. If the result is zero, the received data is accepted; otherwise discarded.

88. The commonly used protocol for webpage transfer is _____

- A. HTML
- B. HTTP
- C. WML
- D. WTPP

Ans. B

Sol. **HTTP** means HyperText Transfer Protocol. **HTTP** is the underlying protocol used by the World Wide Web and this protocol defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands.

89. 10 people are seated in a row for a photograph. If there are 6 boys and 4 girls, in how many ways can they be seated if all girls are to be seated together and all boys are to be seated together?

- A. 17280
- B. 420
- C. 34560
- D. 840

Ans. C

Sol. 4 girls can be arranged among themselves in 4! ways, while the 6 boys can be arranged among themselves in 6! ways. Considering them as two groups, they can be arranged in 2! ways.

$$\therefore \text{Required number of ways} = 2 \times {}^6P_6 \times {}^4P_4 = 2 \times 6! \times 4! = 34560$$

90. Find the number of ways in which 21 desktops can be distributed among 3 labs in a college such that each lab gets at least one desktop?

- A. 190
- B. 400
- C. 816
- D. 380

Ans. C

Sol. Since each lab must have atleast 1 computer, so give 1 to each , $21-3 = 18$ desktops left, Number of ways of distributing 18 desktops among 3 labs, such that each gets at least one ${}^{18}C_3 = 816$ ways

91. Four jobs to be executed on a single processor system arrive at time 0 in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of A under round robin scheduling with time slice of one time unit is-

- A. 10
- B. 4
- C. 8
- D. 9

Ans. D

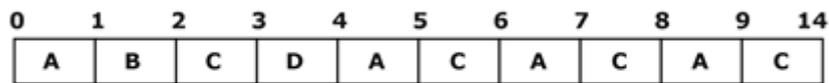
Sol.

Process Id	Arrival time	Burst time
A	0	4
B	0	1
C	0	8
D	0	1

Gantt chart-

Ready Queue-

C, A, C, A, C, A, D, C, B, A



Gantt Chart

Clearly, completion time of process A = 9 unit.

92. All of the following problems are solvable by divide & conquer method except
- A. Quick sort
 - B. Merge sort
 - C. Matrix Multiplication
 - D. Heap sort

Ans. D

Sol. **option 4** -Heap sort is not based on Divide & conquer ,Heap sort is a comparison based sorting technique based on Binary Heap data structure. It is similar to selection sort where we first find the maximum element and place the maximum element at the end.

Quicksort is a divide-and-conquer algorithm. It works by selecting a 'pivot' element from the array and partitioning the other elements into two sub-arrays.

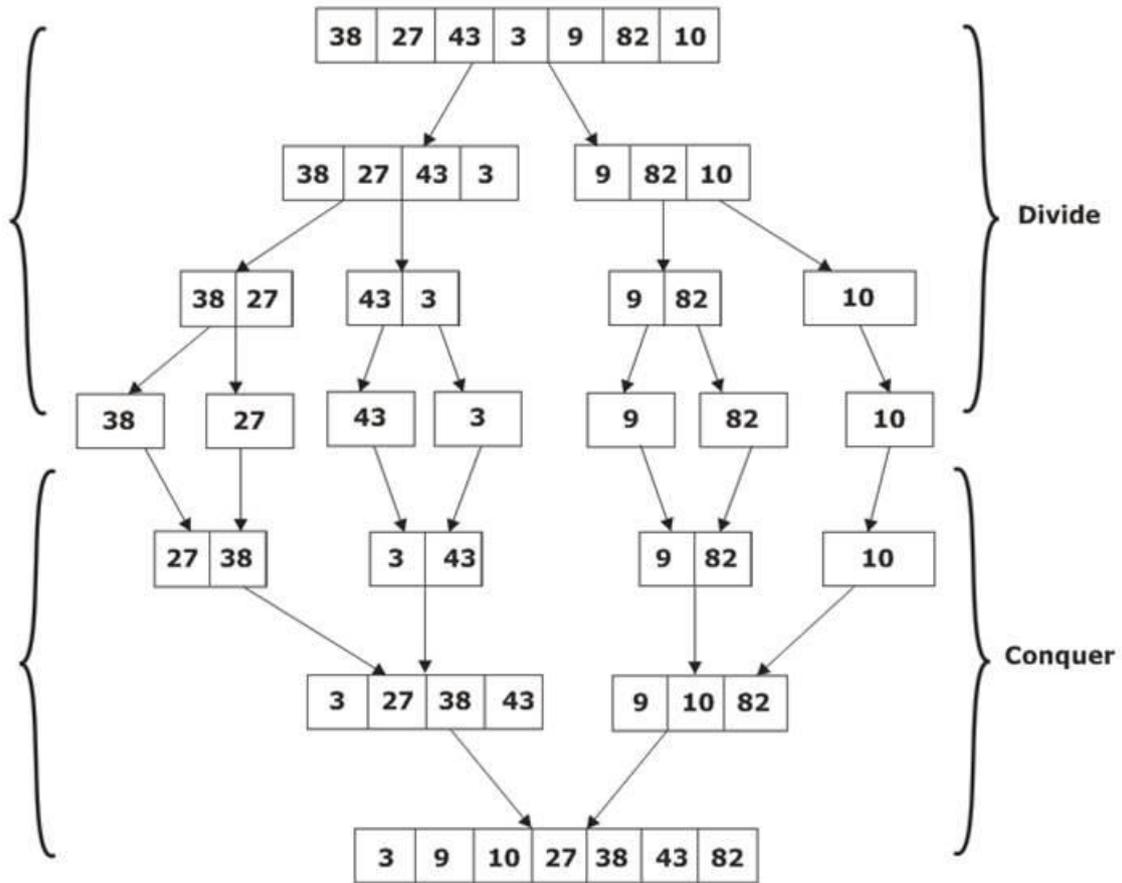
Merge sort is one of the most efficient **sorting** algorithms. It works on the principle of Divide and Conquer.

Matrix Multiplication is Divide and Conquer using Block Partitioning.

93. Merge sort uses :
- A. Divide-and-conquer
 - B. Backtracking
 - C. Heuristic approach
 - D. Greedy approach

Ans. A

Sol.



An Example of Merge Sort

94. What is the converse of the following assertion?
 "I can top the exam only if I study"
- A. I can top the exam if I study
 - B. If I can top the exam then I study
 - C. If I do not study then I cannot top the exam
 - D. If I cannot top the exam then I study

Ans. A

Sol. Statement Says :

If I can top the exam then I study

i.e. $P \text{ ONLY IF } Q \equiv \text{IF } P \text{ then } Q$

So, converse of $P \rightarrow Q$ is $Q \rightarrow P$

So, converse of above statement is

I can top the exam If I study.

95. The set of intelligent students in a class is
- A. A null set
 - B. A singleton set
 - C. A finite set
 - D. Not a well-defined collection

Ans. D

Sol. Since, intelligence is not defined for students in a class i.e., Not a well-defined collection.

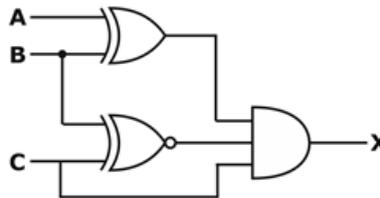
96. Without any additional circuitry, an 8 : 1 MUX can be used to obtain?
- A. Some but not all functions of 3 variable.
 - B. None of the functions of 4 variables.
 - C. All functions of the 4 variables.
 - D. All functions of 3 variables and some but not all of 4 variables.

Ans. D

Sol. 8 : 1 MUX can be used to obtain

- All functions of 3 variables.
- Some but not all of 4 variables functions.

97. For the logic circuit shown in the figure, the required input condition (A, B, C) to make the output X = 1 is



- A. 1, 0, 1
- B. 0, 0, 1
- C. 1, 1, 1
- D. 0, 1, 1

Ans. D

Sol. For X = 1

$$A \oplus B = 1 \text{ i.e. } A = 0, B = 1$$

$$B \oplus C = 1, \text{ i.e. } B = 1, C = 1$$

98. When we mention the prototype of a function?
- A. Defining
 - B. Declaring
 - C. Prototyping
 - D. Calling

Ans. B

Sol. A function prototype in C or C++ is a declaration of a function that omits the function body but does specify the function's name, argument types and return type.

While a function definition specifies what a function does, a function prototype can be thought of as specifying its interface.

99. Header files include?

- A. Boolean function
- B. Void function
- C. Library function
- D. All of the above

Ans. C

Sol. Header files include Library functions.

A header file is a file with extension **.h** which contains C function declarations and macro definitions to be shared between several source files. There are two types of header files: the files that the programmer writes and the files that come with your compiler.

100. 0.75 decimal system is equivalent to _____ in octal system

- A. 0.60
- B. 0.52
- C. 0.54
- D. 0.50

Ans. A

Sol. $0.75 = (0.110)_2$
 $= (0.6)_8$

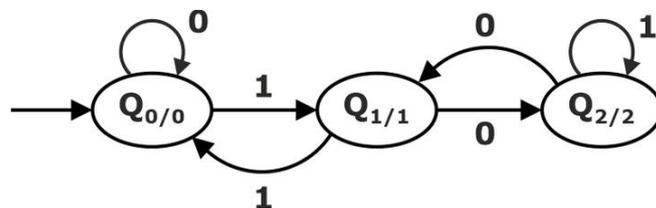
101. The total number of states and transitions required to form a Moore machine that will produce residue mod 3?

- A. 3 and 6
- B. 3 and 5
- C. 2 and 4
- D. 2 and 5

Ans. A

Sol. Moore machine is a finite state machine in which the next state is decided by the current state and current input symbol.

- In the given problem, we need to construct a Moore machine for "mod 3". MOD 3 will generate three residues so, each state in the Moore machine represents a residue (0, 1, 2).
- State "Q_{0/0}" will accept strings like {000, 011, 110, ...}
- State "Q_{1/1}" will accept strings like {001, 100, 111 ...}
- State "Q_{2/2}" will accept strings like {010, 101, 1000



For each state, we have 2 transition moves hence total of 3 states and 6 transitions.

102. Proxy Firewall operates at which layer of OSI Model?

- A. Application layer
- B. Physical layer
- C. Data Link layer
- D. Presentation layer

Ans. A

Sol. • A proxy firewall acts as an intermediary between in-house clients and servers on **the Internet**. It operates at application layer.

- It is used when we want to filter a message on the basis of information contained in message itself.

103. A partial ordered relation is transitive, reflexive and
- A. antisymmetric
 - B. bisymmetric
 - C. antireflexive
 - D. asymmetric

Ans. A

Sol. The axioms for a non-strict partial order state that the relation \leq is reflexive, antisymmetric, and transitive. That is, for all $a, b,$ and c in $P,$ it must satisfy: $a \leq a$ (reflexivity: every element is related to itself). To be a partial order, a binary relation must be reflexive (each element is comparable to itself), antisymmetric (no two different elements precede each other), and transitive

104. Each personal computer has a _____ that manages the computer's arithmetical, logical and control activities.
- A. Microprocessor
 - B. Assembler
 - C. Microcontroller
 - D. Interpreter

Ans. A

Sol. Microprocessor handles all these activities. Each family of processors has its own set of instructions for handling various operations like getting input from keyboard, displaying information on a screen and performing various other jobs.

105. The prime implicant which has at least one element that is not present in any other implicant is known as _____
- A. Essential Prime Implicant
 - B. Implicant
 - C. Complement
 - D. Prime Complement

Ans. A

Sol. Essential prime implicants are prime implicants that cover an output of the function that no combination of other prime implicants is able to cover.

106. Given $\sqrt{224_r} = 13_r$ the value of radix r is
- A. 10
 - B. 8
 - C. 6
 - D. 5

Ans. D

Sol. $\sqrt{224_r} = 13_r$

Taking square on both sides:

$$2r^2 + 2r + 4 = r^2 + 6r + 9$$

$$\begin{aligned} &= r^2 - 4r - 5 = 0 \\ &= (r - 5)(r + 1) = 0 \\ r &= 5 // \text{ since it can't be } -1 \end{aligned}$$

107. A set of FDs is given for a relation R (A, B, C, D)

A → AB

AC → D

ABD → C

Then number of elements in {A, C}⁺ closure?

- A. 3
- B. 4
- C. 5
- D. 6

Ans. B

Sol. The closure set of AC⁺ is as follows:

$$\{A, C\}^+ = \{A, C, B, D\}.$$

It contains only 4 attributes.

108. What is the output of below program?

```
#include <stdio.h>
int foo(int* a, int* b)
{
    int sum = *a + *b;
    *b = *a;
    return *a = sum - *b;
}
int main()
{
    int i = 0, j = 1, k = 2, p;
    p = i++ || foo(&j, &k);
    printf("%d %d %d %d", i, j, k, p);
    return 0;
}
```

- A. 1 2 1 1
- B. 1 1 2 1
- C. 1 2 2 1
- D. 1 2 2 2

Ans. A

Sol. The control in the logical OR goes to the second expression only if the first expression results in FALSE.

The function foo() is called because i++ returns 0(post-increment) after incrementing the value of i to 1

The foo() function actually swaps the values of two variables and returns the value of second parameter.

So, values of variables j and k gets exchanged and OR expression evaluates to be TRUE.

109. Which of the following operations is performed more efficiently by doubly linked list than by linear linked list?
- A. Deleting a node before a node whose location is given
 - B. Searching an unsorted list for a given item
 - C. Inserting a node after the node with a given location
 - D. Traversing the list to process each node.

Ans. A

Sol. Deleting a node before a node whose location is given, it will be easier in DLL because back pointer is provided.

110. In a conservative two-phase locking protocol, which of the following is true regarding a transaction?
- A. Should release all the locks only at beginning of transaction
 - B. Should release exclusive locks only after the commit operation
 - C. Should acquire all the exclusive locks at beginning of transaction
 - D. Should acquire all the locks at beginning of transaction

Ans. D

Sol. In Conservative 2-PL, a transaction should acquire all the locks before the transaction begins execution.

111. The logic expression $(A + B)(\bar{A} + \bar{B})$ can be implemented by giving the inputs A and B to a two-input?
- A. NOR gate
 - B. AND gate
 - C. XOR gate
 - D. XNOR gate

Ans. C

Sol. $(A + B)(\bar{A} + \bar{B}) = A\bar{A} + A\bar{B} + \bar{A}B + B\bar{B} = A\bar{B} + \bar{A}B = A \oplus B$

Hence correct answer is XOR gate.

112. The events A_1 and A_2 occur with probabilities 0.6 and 0.8 respectively. At least one of them occurs with a probability of 0.9. The probability that both A_1 and A_2 will occur is ____.
- A. 0.7
 - B. 0.5
 - C. 0.4
 - D. 0.3

Ans. B

Sol. $P(A_1) = 0.6, P(A_2) = 0.8, P(A_1 \cup A_2) = 0.9$

$$P(A_1 \cap A_2) = P(A_1) + P(A_2) - P(A_1 \cup A_2)$$
$$= 0.6 + 0.8 - 0.9 = 0.5$$

113. What is the median of the data if its mode is 15 and the mean is 30?

- A. 20
- B. 25
- C. 22.5
- D. 27.5

Ans. B

Sol. $3 \text{ median} - 2 \text{ mean} = \text{mode}$

$$3 \text{ median} = 15 + 2(30)$$

$$\text{Median} = 75/3$$

$$\text{Median} = 25$$

114. What is the assigned bandwidth of each of the channels in the AM broadcast band?

- A. 5 KHz
- B. 10 KHz
- C. 15 KHz
- D. 200 KHz

Ans. B

Sol. 10 KHz channel BW is assigned for AM broadcast.

115. A subnet has been assigned a subnet mask of 255.255.255.192 . What is the maximum number of hosts that can belong to this subnet?

- A. 32
- B. 64
- C. 62
- D. 126

Ans. C

Sol. In a subnet mask, the the number of continuous 0's are the subnet bits.

$$255.255.255.192 \Rightarrow 11111111.11111111.11111111.11000000$$

Since we have 6 subnet bits, we can make $= 2^6 - 2 = (64 - 2) = 62$ hosts.

116. What is recurrence for worst case of Quick Sort and what is the time complexity in Worst case?

- A. Recurrence is $T(n) = T(n-2) + O(n)$ and time complexity is $O(n^2)$
- B. Recurrence is $T(n) = T(n-1) + O(n)$ and time complexity is $O(n^2)$
- C. Recurrence is $T(n) = 2T\left(\frac{n}{2}\right) + O(n)$ and time complexity is $O(n \log n)$
- D. Recurrence is $T(n) = T\left(\frac{n}{10}\right) + T\left(\frac{9n}{10}\right) + O(n)$ and time complexity is $O(n \log n)$

Ans. B

Sol. The worst case of Quick Sort occurs when the picked pivot is always one of the end elements in sorted array i.e. either minimum or maximum. In worst case, Quick Sort recursively calls one

subproblem with size 0 and other subproblem with size (n-1). So recurrence is $T(n) = T(n-1) + T(0) + O(n)$ The above expression can be rewritten as $T(n) = T(n-1) + O(n)$

117. A term saying that no two transactions to be executed concurrently is called as:

- A. Atomicity
- B. Isolation
- C. Durability
- D. None

Ans. B

Sol. Isolation is referred to as no two transactions to be executed concurrently. Every transaction should be independent of the other.

118. Select _____ dept_name
from instructor;

Here which of the following displays the unique values of the column?

- A. All
- B. From
- C. Distinct
- D. Name

Ans. C

Sol. Distinct keyword selects only the entries that are unique.

119. Ring counter is analogous to

- A. Toggle Switch
- B. Latch
- C. Stepping Switch
- D. S-R flip flop

Ans. C

Sol. A ring counter is a type of counter composed of flip-flops connected into a shift register, with the output of the last flip-flop fed to the input of the first, making a "ring" structure and for each clock pulse, counter advances switch by one step like in sequential gating systems. So, it works similar as a Stepping Switch. Option C. is correct.

120. The race around condition occurs in a level trigger J-K flip-flop when

- A. Both the inputs are 0
- B. Both the inputs are 1
- C. J = 1 and K = 0
- D. J = 0 and K = 1

Ans. B

Sol. In J-K flip-flop

J	K	Output
1	0	Set
0	1	Reset
0	0	Hold
1	1	Race around

121. Consider an array contain n distinct elements. In array till 'i' location element are in increasing order and after 'i' location all elements are in decreasing order. What is the time complexity to find location of ith element?

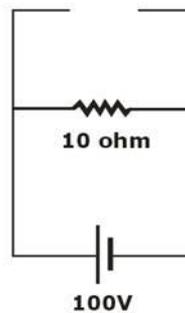
- A. $O(\log n)$
- B. $O(n)$
- C. $O(n \log n)$
- D. $O(\log \log n)$

Ans. A

Sol. Since we have two sorted order of element, hence searching an element in the sorted order can be done by binary search. Sequential application of modified binary search on the two sequences will be,

$$(\log n) + (\log n) = O(\log n)$$

122. The voltage across the open circuit is?



- A. 100V
- B. Infinity
- C. 90V
- D. 0V

Ans. A

Sol. The voltage across all branches in a parallel circuit is the same as that of the source voltage. Hence the voltage across the 10 ohm resistor and the open circuit is the same=100V.

123. In a compiler, the data structure responsible for the management of information about variables and their attributes is

- A. Semantic stack
- B. Parser table
- C. Symbol table
- D. Abstract syntax-tree

Ans. C

Sol. Symbol table is an important data structure created and maintained by compilers in order to store information about the occurrence of various entities such as variable names, function names, objects, classes, interfaces, etc. Symbol table is used by both the analysis and the synthesis parts of a compiler.

124. Which addresses can be given to devices in network 131.107.0.0 with a standard class B subnet mask?

- (i) 131.107.255.255
- (ii) 131.107.0.1

(iii) 131.107.1.0

(iv) 131.107.0.0

A. Only (i)

B. Only (iii)

C. Only (ii)

D. (ii) and (iii)

Ans. D

Sol. The IP address given, 131.107.0.0, is a class B network which has a default subnet mask of 255.255.0.0. The subnet mask used in this problem is 255.255.0.0, which means that we have 16 network bits and 16 host bits. Therefore, this network is not subnetted.

If we convert this subnet mask to binary, we would have the dotted binary representation as:

11111111.11111111.00000000 00000000

To determine the number of subnets, use the $2^n - 2$ formula on the number of host bits (16).

This yield

$$2^{16} - 2 = 65536 - 2 = 65534 \text{ (hosts per subnet)}$$

The IP address in the, 131.107.0.0 would therefore fall in the range between 131. 107.0.0 and 131.107.255.255.

There are 65534 usable IP addresses in this range.

We cannot use the first, **131.107.0.0 because this is the network number itself**. This number cannot be assigned to a host.

The last number in this subnet is **131.107.255.255, but this cannot be assigned to a host because this the directed broadcast address (DBA) for that subnet.**

This leaves us with the first usable IP addresses of 131.107.0.1, and all addresses between it and the DBA are valid.

The last IP address that can be assigned to a host would be 131.107.255.254.

125. The situation wherein the data of operands are not available is called _____

A. Data hazard

B. Stock

C. Deadlock

D. Structural hazard

Ans. A

Sol. Data hazards are generally caused when the data is not ready on the destination side.

126. Which of the following is correct with regard to insertion sort?

A. insertion sort is stable and it sorts In-place

B. insertion sort is unstable and it sorts In-place

C. insertion sort is stable and it does not sort In-place

D. insertion sort is unstable and it does not sort In-place

Ans. A

Sol. During insertion sort, the relative order of elements is not changed. Therefore, it is a stable sorting algorithm. And insertion sort requires only $O(1)$ of additional memory space. Therefore, it sorts In-place.

127. Which of the following has best lower bound time complexity?

- A. Merge sort
- B. Quick sort
- C. Selection sort
- D. Insertion sort

Ans. D

Sol. In best case merge sort time complexity = $O(n \log n)$

For Quick sort in best case = $O(n \log n)$

For Selection sort = $O(n^2)$

For insertion sort = $O(n)$

128. What are the ACID properties of a transaction:

- A. Atomicity, Consistency, Inconsistency, Durability
- B. Automatically, Consistency, Inconsistency, Durability
- C. Atomicity, Consistency, Isolation, Durability
- D. Atomicity, Consistency, Inconsistency, Dependency

Ans. C

Sol. The property of transactions are: Atomicity, Consistency, Isolation, Durability

129. Which of the following is the correct order of keywords for SQL SELECT statements?

- A. SELECT, FROM, WHERE
- B. FROM, WHERE, SELECT
- C. WHERE, FROM, SELECT
- D. SELECT, WHERE, FROM

Ans. A

Sol. Correct order is

SELECT, FROM, WHERE

130. Consider a matrix P whose only eigenvectors are the multiples of $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$.

Consider the following statements:

I. P does not have an inverse.

II. P has a repeated eigenvalue.

III. P cannot be diagonalized.

Which one of the following options is correct?

- A. Only I and II are necessarily true
- B. Only II is necessarily true
- C. Only I and III are necessarily true
- D. Only II and III are necessarily true

Ans. D

Sol. Only Eigen vector is $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$ multiples means that eigen value is repeated since if eigen values were

distinct we will get one more independent eigen vector. So, II P has repeated eigen value is true.

I need not be true since $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ has repeated eigen values and yet it is invertible. III is true since if matrix has repeated eigen values then it cannot be diagonalizable.

131. The larger of the two Eigen values of the matrix $\begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$ is _____.

- A. 5
- B. 6
- C. 7
- D. 8

Ans. B

Sol. The character equation for given matrix is

$$|4-\lambda \ 5|=0$$

$$|2 \ 1-\lambda|$$

$$(4-\lambda)*(1-\lambda)-10=0$$

$$\lambda^2-5\lambda-6=0$$

$$(\lambda+1)*(\lambda-6)=0$$

$$\lambda = -1, 6$$

Greater of two Eigen values are 6

132. A determinant of the second order is made with the elements 0 and 1. What is the probability that the determinant made is positive?

- A. 3/16
- B. 13/16
- C. 15/16
- D. 14/6

Ans. A

Sol. Total number of determinants that can be formed using 0 and 1 = $16(4 \times 4)$

The positive determinants are , $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ i.e, 3 in number.

∴ Required probability = 3/16

133. A 3×3 matrix is defined as

$$A = \begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$$

The values of x required for which A^{-1} can't be determined will be?

- A. 0, 3, 3
- B. 0, 1, 3
- C. 0, 1, 4
- D. 1, 1, 3

Ans. A

Sol. For A^{-1} to be non existent, $|A| = 0$

$$|A| = \begin{vmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$R_2 \rightarrow R_2 + R_3$$

$$\begin{vmatrix} 3-x & 2 & 2 \\ 0 & -x & -x \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$(-x) \begin{vmatrix} 3-x & 2 & 2 \\ 0 & 1 & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$R_1 \rightarrow R_1 - 2R_2$$

$$(-x) \begin{vmatrix} 3-x & 0 & 0 \\ 0 & 1 & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$(-x)(3-x(-1-x+4)) = 0$$

$$(-x)(3-x)(3-x) = 0$$

$$x = 0, 3, 3$$

134. The rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ is _____.

- A. 3
- B. 2
- C. 1
- D. 0

Ans. B

Sol. $R_3 \leftarrow R_1 - R_3$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

$$\text{Rank} = 2$$

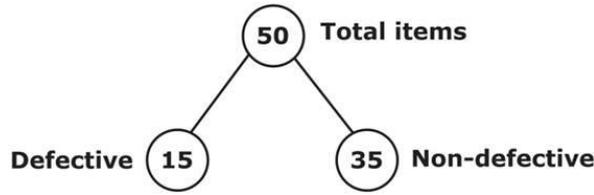
Alternative way: Rank of the matrix is nothing but the number of unique rows in the matrix

135. A bag contains 15 defective items and 35 non defective items. If three items are selected at random without replacement, what will be the probability that all three items are defective?

- A. $\frac{1}{40}$
- B. $\frac{13}{560}$
- C. $\frac{15}{34}$
- D. $\frac{12}{499}$

Ans. B

Sol.



Probability of first item being defective, $P_1 = \frac{15}{50}$

Probability of second item being defective, $P_2 = \frac{14}{49}$

Probability of third item being defective, $P_3 = \frac{13}{48}$

Probability that all three are defective,

$$P = P_1 \times P_2 \times P_3$$

$$= \frac{15}{50} \times \frac{14}{49} \times \frac{13}{48} = \frac{13}{560}$$

136. A packet of 20 batteries is known to include 4 batteries that are defective. If 8 batteries are randomly chosen and tested, the probability of finding among them not more than 1 defective battery is

- A. 0.5033
- B. 0.4905
- C. 0.5125
- D. 0.5205

Ans. A

Sol. Probability of choosing a defective battery = $\frac{4}{20} = \frac{1}{5}$

Probability of choosing a non-defective battery = $1 - \frac{1}{5} = \frac{4}{5}$

p (not more than 1 out of 8) = p (0 defective out of 8) + p (1 defective out of 8)

$$= {}^8C_0 \left(\frac{1}{5}\right)^0 \left(\frac{4}{5}\right)^8 + {}^8C_1 \left(\frac{1}{5}\right)^1 \left(\frac{4}{5}\right)^7$$

$$= \frac{4^8}{5^8} + \frac{8 \cdot 4^7}{5^8} = \frac{196608}{390625} = 0.5033$$

137. Consider there are 5 fair coins and 4 unfair coins where we toss unfair coin then probability of getting heads is 1/3. We put these 9 coins in a bag. The probability of getting fair coin if tail is already shown

- A. 5/18
- B. 15/31
- C. 23/31
- D. None of the above

Ans. B

Sol. The probability of getting fair coin if tail is already shown

$$=P(F/T) = P(F \cap T) / P(T) = P(F) * P(T/F) / P(T) = (P(F) * P(T/F)) / (P(F) * P(T/F) + P(U) * P(T/U))$$

Where F denotes fair coin and T denotes tail.

According to , $P(F) = 5/9, P(T/F) = 1/2, P(U) = 4/9, P(T/U) = 2/3$

After putting these value, probability of getting fair coin if tail is already shown = $15/31$

138. Match the following Lists.

List-I

A- $\binom{n}{x} \cdot P^x (1 - P)^{n-x}$

B- $\frac{e^{-\lambda} \cdot \lambda^x}{x!}$

C- $\lambda \cdot e^{-ix}$

D- $\frac{1}{b - a}$

List-II

1- Discrete distribution

2- Continuous distribution

A. A-1, B-2, C-1, D-2

B. A-2, B-1, C-2, D-1

C. A-1, B-1, C-2, D-2

D. A-2, B-2, C-1, D-1

Ans. C

Sol. A. Binomial distribution (discrete)

$$P(x) = \binom{n}{x} \cdot P^x \cdot (1 - P)^{n-x}, x \geq 0$$

B. Poisson distribution (discrete)

$$P(x) = \frac{e^{-\lambda} \lambda^x}{x!}, x \geq 1$$

C. Exponential distribution (continuous)

$$f(x) = \lambda \cdot e^{-ix}, 0 < x < \infty$$

D. Uniform distribution (continuous)

$$f(x) = \frac{1}{b - a} \text{ for } a < x < b$$

139. What is the output of the following program-

main ()

{

int a = 324;

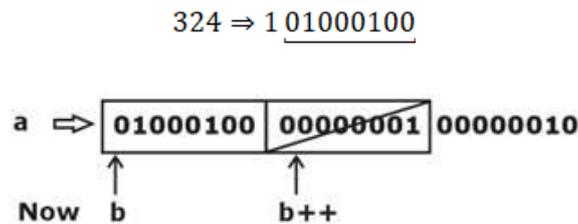
char * b = (char *) &a;

```
b++;
*b = 2;
printf("%d", a);
}
```

- A. 540
- B. 590
- C. 580
- D. 510

Ans. C

Sol. A in memory is stored is-



a = 512 + 68 = 580.

140. The Output of below code is-

```
int main()
{
    int a[] = { 1, 2, 3, 4, 5,6, 7,8,9};
    int *ptr;
    ptr = a;
    printf(" %d ", *( ptr + 1 ));

    return 0;
}
```

- A. 2
- B. 3
- C. 4
- D. 1

Ans. A

Sol. It is possible to assign an array to a pointer. so, when ptr = a; is executed the address of element a[0] is assigned to ptr and *ptr gives the value of element a[0]. When *(ptr + n) is executed the value at the nth location in the array is accessed.

1	2	3	4	5	6	7	8	9	\0
Ptr	Ptr+1	Ptr+2	Ptr+3	Ptr+4	Ptr+5	Ptr+6	Ptr+7	Ptr+8	Ptr+9

141. Consider the following C program.

```
#include < stdio.h>
void mystery(int * ptra, int * ptrb) {
    int *temp;
    temp = ptrb;
    ptrb = ptra;
```

```

ptr = temp;
3
int main() {
int a=2016,b=0,c=4,d=42;
mystery (&a, &b);
if (a<c)
mystery(&c, &a);
mystery(&a, &d);
printf("%d \n", a);
}

```

The output of the program is _____.

- A. 201
- B. 2016
- C. 016
- D. 6

Ans. B

Sol. Output is not affected by the function mystery () as it is just taking the address of a&b into ptr a & ptr b and contents of ptr a & ptr b are swapped leaving a & b as it is. Option B is the correct answer.

142. Consider the following C function:

```

int foo(int x, int y){
    if(y==1)
        return x;
    else
        return x + foo(x,y-1);
}

```

What will the function return when x=4 and y = 2?

- A. 16
- B. 8
- C. 6
- D. 2

Ans. B

Sol. $f(4,2) \rightarrow 4 + f(4,1) \rightarrow 4 + 4 = 8$

143. Consider a 2D array $A[-5\dots 5][10\dots 15]$, the base address is 100 and word length 2B find the address of the element $A[2][13]$ using Row major order?

- A. 190
- B. 200
- C. 176
- D. 180

Ans. A

Sol. In row major order $A[i][j] = \text{Base address} + W * [(i - L_1) * (U_2 - L_2 + 1) + (j - L_2)]$

Here values are :-

Base address = 100

$W = 2 B$

$$i = 2$$

$$j = 13$$

$$L_1 = -5$$

$$U_1 = 5$$

$$L_2 = 10$$

$$U_2 = 15$$

On substituting values

$$A[2][13] = 100 + 2 * [(2 - (-5)) * (15-10+1) + (13 - 10)]$$

$$A[2][13] = 190$$

144. Match the following data structures and their applications?

- 1) Stack
- 2) Queue
- 3) Linked list
- 4) Trees

List-I

- p. Serving request of singled shared resource
- q. Implementing other data structures
- r. Recursive function
- s. Implementing algorithms

A. 1-s 2-q 3-p 4 -r

B. 1-r 2- p 3-s 4 - q

C. 1- r 2- s 3- q 4 - p

D. 1-r 2-p 3-q 4 - s

Ans. D

Sol. Correct order is

- 1. Stack : Recursive function
- 2. Queue : Serving request of singled shared resource
- 3. Linked list : Implementing other data structures
- 4. Trees : Implementing algorithms

145. Consider the following code which is implemented on a linked list :

```
Struct node *ABC(Struct node *S)
{
Struct node *p,*q;
p = q = S;
while(q!=null && q->next !=null && q->next->next !=null)
{
p = p->next;
q = q->next->next;
}
```

```

return p;
}

```

What does the code return when the head of a linked list is passed as an argument to the code ?

- A. Returns the third element from last
- B. Returns the second element from last
- C. Returns the middle element of linked list
- D. Returns the last element of linked list

Ans. C

Sol. We are maintaining two pointers P and Q. P is always incremented by 1 and Q is always incremented by 2 Hence when Q reaches last, P will be at middle. Hence the code finds out the middle element of the linked list.

146. A machine needs a minimum of 100 sec to sort 1000 names by quick sort. The minimum time needed to sort 100 names will be approximately _____ sec

- A. 4.6
- B. 6.64
- C. 2
- D. 7

Ans. B

Sol. *Running time of quick sort = c n lg n*

For n = 1000, we get

*100 = c * 1000 * lg 1000 => c = 0.01*

*So, for n = 100, we get running time = 0.01*100*log100=6.64 because log is base 2*

147. The worst case running time of Insertion sort, Merge sort and Quick sort, respectively, are:

- A. $\theta(n \log n)$, $\theta(n \log n)$, and $\theta(n^2)$
- B. $\theta(n^2)$, $\theta(n^2)$ and $\theta(n \log n)$
- C. $\theta(n^2)$, $\theta(n \log n)$, and $\theta(n \log n)$
- D. $\theta(n^2)$, $\theta(n \log n)$, and $\theta(n^2)$

Ans. D

Sol. Merge sort $\theta(n \log n)$ in all the cases

Quick sort $\theta(n \log n)$ best case and $\theta(n^2)$ worst cases

Insertion sort $\theta(n)$ best case and worst case

148. Consider an array consisting of the following elements in unsorted order (placed randomly), but 60 as first element.

60, 80, 15, 95, 7, 12, 35, 90, 55

Quick sort partition algorithm is applied by choosing first element as pivot element. How many total number of arrangements of array integers is possible preserving the effect of first pass of partition algorithm.

- A. 718
- B. 720
- C. 724
- D. 728

Ans. B

Sol. We have to choose first element as pivot.

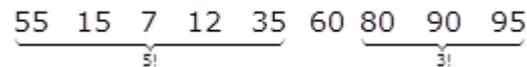
Here 60 is given as first element.

After first pass, the pivot element goes to its exact location.

Here 60 goes to 6th place.

All the elements less than 60 go to left of 60 and all the elements greater than 60 go to right of 60.

After 1st pass



⇒ 5! × 3!

⇒ 720 possible arrangements.

149. The Boolean expression $Y = (A + B' + A'B) C'$ is given by?

- A. $A'C'$
- B. BC'
- C. C'
- D. AB

Ans. C

Sol. $Y = (A + B' + A'B)C'$

$Y = AC' + B'C' + A'BC'$

$Y = (A + A'B)C' + B'C'$

$Y = (A + B)C' + B'C'$

$Y = AC' + BC' + B'C'$

$Y = AC' + C'(B + B') // B + B' = 1$

$Y = AC' + C'$

$Y = C'$

So, option C is correct.

150. With 3 Boolean variables, how many Boolean expressions can be formed.

- A. 128
- B. 256
- C. 64
- D. 512

Ans. B

Sol. Number of possible functions with n variable.

$= 2^{2^n}$

Here n=3.

$2^{2^3} = 2^8 = 256$
