

Q.1)

Which of the following statements is/are True?

- I. A tree with  $n$  nodes and the property that the heights of the two children of any node differ by at most 2 has  $O(\log n)$  height.  
 II. The depths of any two leaves in a max heap differ by at most 1.



Only I



Only II



Both I and II

Correct Option

Solution: (C)

Solution:

- I. True. Using the same approach as proving AVL trees have  $O(\log n)$  height, we say that  $n_h$  is the minimum number of elements in such a tree of height  $h$ .
 
$$n_h \geq 1 + n_{h-1} + n_{h-3} \quad (1)$$

$$n_h > 2n_{h-3} \quad (2)$$

$$n_h > 2^{h/3} \quad (3)$$

$$h < 3\log n_h \quad (4)$$

$$h = O(\log n) \quad (5)$$
- II. True. A heap is derived from an array and new levels to a heap are only added once the leaf level is already full. As a result, a heap's leaves are only found in the bottom two levels of the heap and thus the maximum difference between any two leaves' depths is 1.



Neither I nor II

Q.2)

Consider the following statements:

Subject: Discrete Mathematics

Max Marks: 1

S1:  $a = a$ 

S2: Are you leaving?

Which of the following options are not false?



Only S1 is a proposition



Only S2 is a proposition



Both S1 and S2 are propositions



None of the above

Correct Option

Solution: (D)

Explanation

S1:

" $a = a$ " is not a proposition because we don't know what " $a$ " represents hence what " $=$ " means. For example, while we understand what " $3=3$ " means, what does "Air is equal to air" or "Water is equal to water" mean? Does it mean a mass of air is equal to another mass or the concept of air is equal to the concept of air? Likewise, we don't quite know what " $a = a$ " mean. Thus we can not say whether it is true or not. Hence it is not a proposition.

S2:

The given statement is a question and not an assertion. Therefore, it is not a proposition.

Q.3)

Consider the following Professor relation with the following tuples:

Subject: DBMS

Max Marks: 1

Prof_name	Rating
Supriya	8.7
Rajat	9.7
Sambhavi	8.5
Nikita	9.8
Rupal	8.7
Anmol	8.5

QUESTION 3: WHICH ONE OF THE FOLLOWING QUERIES IS CORRECT?

SELECT Rating FROM Professor P1  
WHERE 5 >= (SELECT COUNT(\*) FROM Professor P2 WHERE P1.Rating <= P2.Rating);

A

3

B

4

Correct Option

Solution: (B)

Solution:

Initially in the inner query first tuple will compare its rating with the every other tuple (including itself) and the will return the count of tuples for which its rating is <= to rating of other tuples.

For example: For first tuple (Supriya, 8.7), rating will be compared as follows:

8.7 <= 8.7 = true. Hence, Count = 1,  
8.7 <= 9.7 = true. Hence, Count = Count + 1 = 2,  
8.7 <= 8.5 = false. Hence, Count = 2,  
8.7 <= 9.8 = true. Hence, Count = Count + 1 = 3,  
8.7 <= 8.7 = true. Hence, Count = Count + 1 = 4,  
8.7 <= 8.5 = false. Hence, Count = 4,

So, the inner query will return 4 for first tuple. The outer query will do comparison  $5 \geq 4$  i.e True hence, 8.7 is added in the result set.

This comparison is done for each tuple with every other tuple and will lead to the output as:

Rating
8.7
9.7
9.8
8.7

Hence, the number of tuples in the output relation is 4.

C

5

D

None of the above

Q.4)

Subject: Computer Networks

Max Marks: 1



In the GO back N sliding window protocol the value of N is 70 % of the factor 'a'. Where 'a' is the ratio of propagation time to the transmission time. The efficiency of GBN is 30 %. What will be the transmission time in a micro sec of the protocol where the length of the channel is 900 m and the speed on which signal propagates is similar to the speed of light in a vacuum?

A

Correct Answer

Solution: (1)

**Explanation:**

$$a = T_p / T_t$$

$$\text{Efficiency} = W_s / (1+2a)$$

$$30/100 = W_s / 1+2a$$

$$W_s = 70\% \text{ of } a = 0.7a$$

$$0.3 = 0.7a / (1 + 2a)$$

$$0.3 + 0.6a = 0.7a$$

$$a = 3$$

$$T_p = 900 \text{ m} / (3 \times 10^8 \text{ m/s}) = 3 \mu \text{sec}$$

$$a = T_p / T_t$$

$$3 = 3 \mu \text{sec} / T_t$$

$$T_t = 1 \mu \text{sec}$$

Q.5)

Which of the following sorting techniques cannot be used in Radix sort to sort the individual digits?

Subject: Algorithms

Max Marks: 1



A

Merge Sort

B

Bubble Sort

C

Quick Sort

Correct Option

Solution: (C)

Solution:

For Radix sort requires the individual digits to be sorted by a stable sorting algorithm Quick Sort is not a stable sorting algorithm which is why it cannot be used in Radix Sort.

D

None of the above.

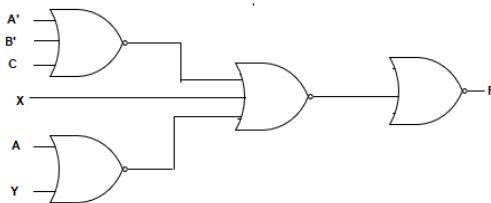
Q.6)

Subject: digital logic systems

Max Marks: 1

Determine the value of X and Y in the below given circuit implementation of function

$$F(A, B, C) = ABC' + B' + A'B.$$



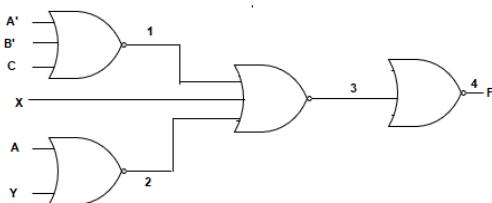
A  $X = B', Y = A$

B  $X = Y = A$

C  $X = Y = B'$

Correct Option

Solution: (C)

**Solution:**

Expression at 1 will be:  $(A' + B' + C)' = ABC'$

Expression at 2 will be:  $(A + Y)' = A'Y'$

Expression at 3 will be:  $(ABC' + X + A'Y')' = ABC' + X + A'Y'$

Expression at 4 will be:  $((ABC' + X + A'Y')')' = ABC' + X + A'Y'$

On equating this with the resultant function we have we will get  $X = Y = B'$

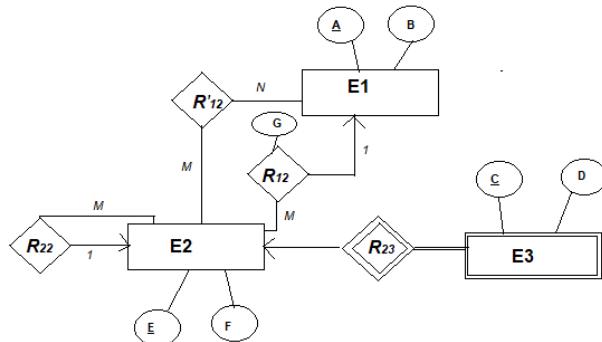
D None of the above

Q.7)

Subject: DBMS

Max Marks: 1

Consider the following E-R diagram:



Which of the following statements is true about the above E-R diagram?

- I. The attribute G will be placed in the relation E2 and attribute E will be present in E1 as a foreign key.
- II. The Relational model of the above E-R diagram will have a minimum of 5 foreign keys.

A Only I

B Only II

Correct Option

Solution: (B)

**Solution:**

- I. It is correct to say that attribute G will be placed in the relation formed by entity E2 but attribute E will not be the foreign key in E1 referring to E2. Infact attribute A will be present in relation formed by E2 as a foreign key and will refer to relation formed by E1. Therefore, this statement is false.
- II. The above relation will have a minimum of 5 foreign keys in their

RDBMS mode.

The analysis will be as follows:

- (i) Attribute E will be present in the relation formed by E3 as foreign key (as E3 is a weak relation). Therefore, # of foreign key = 1
- (ii) Attribute E will be foreign key to its relation E2 itself due to relation R<sub>22</sub>. Therefore, # of foreign key = 2.
- (iii) Attribute A will be present in relation formed by E2 as foerign key, referring to relation formed by E1 due to relation R<sub>12</sub>. Therefore, # of foreign keys = 3
- (iv) Attribute E and A will be present in the relation formed by relationship R'₁₂ (many-to-many relationships). Therefore, # of foreign keys = 3 + 2 = 5

Hence, the total number of foreign keys = 5. Therefore this statement is true.

C

Both I and II

D

Neither I nor II

Q.8)

Consider the following statements with respect to Dynamic Programming algorithm design strategy.

- I. Dynamic Programming is an algorithm design technique which makes use of Recursion
- II. Dynamic Programming makes use of Memoization

A

Statement II & I are always true

B

Statement I is always true but Statement II may or may not be true.

C

Statement II is always true but Statement I may or may not be true.

D

Both Statement I and II may or may not be true.

Subject: Algorithms

Max Marks: 1



Correct Option

Solution: (D)

Solution:

Dynamic programming makes use of memoization if the algorithm is designed using top-down and it uses tabulation if it is designed using a bottom-up approach. A Dynamic Programming algorithm uses recursion only when the DP algorithm is designed using the top down approach when the bottom-up approach is used it does not make use of recursion.

Therefore both the statements may or may not be true in the case of Dynamic Programming.

Q.9)

If resources in a system is not a constraint, what is the total number of processes if we execute the following piece of code:

```
main()
{
for();
fork();
}
```

A

1

B

2

C

Infinite

Correct Option

Solution: (C)

Explanation:

Since there is no initialization, condition and update statement in the for loop, the for loop takes as a True condition of the loop.

Since the for loop takes it as true, it goes inside the loop and executes the body of the for loop. So for every cycle the for loop shows true. The for(;;) behaves as an infinite for loop. Given that there are no constraints on resources in the system, that is infinite memory(say), therefore, fork will create child processes infinitely.

D

None of the above

Q.10)

Consider the following function foo

Subject: C Programming

Max Marks: 1



```
int foo(int *a, int s, int e)
{
    if (s > e)
        return e + 1;
}
```

```

if (s != a[s])
    return s;
int m = (s + e) / 2;
if (a[m] == m)
    return foo(a, m+1, e);
return foo(a, s, m);
}

```

What is the above function foo doing? (Assume an array contains n distinct elements. And the elements present in an array are in sorted order where each number is present in range from 0 to k-1 and k>n.)

A	Find the largest missing number	
B	Find the smallest missing number	Correct Option
<b>Solution:</b> (B) <b>Solution:</b> Let's take a simple example: $A = [0, 1, 2, 3, 4, 5, 6, 7, 10]$ Here first missing smallest number is 8 The above code is to find the smallest missing element in an array Algorithm works as follows The element to be searched is compared with the middle element and on the basis of comparison result, we decide whether to search is over or to go to left half or right half. In this method, we modify the standard Binary Search algorithm to compare the middle element with its index and make decision on the basis of this comparison. 1) If the first element is not same as its index then return first index 2) Else get the middle index say (m) a) If $a[m]$ greater than m then the required element lies in left half. b) Else the required element lies in right half.		

C	Find the Second Largest Missing Number	
D	Find the Second smallest missing Number	

Q.11)

If a is any scalar then the value of the determinant of the matrix below is
Subject: Engineering-Mathematics
Max Marks: 1

$$\begin{vmatrix} 2 & 2+a & 3 \\ 3 & 3+a & 4 \\ 7 & 7+a & 9 \end{vmatrix} =$$

A	0
B	a
C	-a
Correct Option	

**Solution:** (C)  
**Solution:**  
 Applying column transformation C2->C2-C1 and taking a common

$$\begin{vmatrix} 2 & 1 & 3 \\ 3 & 1 & 4 \\ 7 & 1 & 9 \end{vmatrix} \xrightarrow{\text{R1} - 2\text{R2}} \begin{vmatrix} 1 & 4 & 3 \\ 3 & 1 & 4 \\ 7 & 1 & 9 \end{vmatrix} \xrightarrow{\text{R2} - 3\text{R1}} \begin{vmatrix} 1 & 4 & 3 \\ 0 & -2 & -7 \\ 7 & 1 & 9 \end{vmatrix} \xrightarrow{\text{R3} - 7\text{R1}} \begin{vmatrix} 1 & 4 & 3 \\ 0 & -2 & -7 \\ 0 & -27 & -18 \end{vmatrix} = -1$$

Multiply with a we get -a.

D	None of the above
---	-------------------

Q.12)

The size of the memory could be given as:
Subject: digital logic systems
Max Marks: 1

Size of the memory = Number of Words \* Number of bits per word

Which of the following is correct about the number of address lines and data lines required to construct a memory circuit of size 256 X 32 using a decoder and a multiplexer.

A	Address bus: 8 bits, Data bus: 5 bits	
B	Address bus: 8 bits, Data bus: 32 bits	Correct Option
<b>Solution:</b> (B) <b>Solution:</b> In a memory circuit constructed using a decoder and a multiplexer, the input lines to the decoder are referred as the address bus (for example, 2 X 4 decoder need 2 bits address in order to point the 4 different addresses, thus the size of address bus is 2 bits).		

different addresses, thus the size of address bus is 2 bits). While Data bus corresponds to the vertical lines of the memory matrix where each vertical line is considered as a bit. (For example, for 2 X 1 mux the number of functions it can represent is  $2^2 = 4$ , thus data bus is of 4 bits.)

In the given case size of memory is given as 256words X 32bits which is implemented using a decoder. To represent 256 words we need 8 bits ( $8 \times 2^8$  decoder) and 32 bits/functions could be represented by a 5 X 1 multiplexer. Thus, the size of the address bus is 8 bits and size of data bus is 32 bits.

C Address bus: 5 bits, Data bus: 8 bits

D Address bus: 32 bits, Data bus: 8 bits

Q.13)

Subject: Computer Networks

Max Marks: 1

The message M is converted to message digest using the hash function H(). The sender A sends the encrypted message digest to the receiver B and the receiver decrypts the message to authenticate the sender. The private key is called Pr and the public key is called Py respectively. The message received by the receiver is?

A Pr(A)H(M) Correct Option

Solution: (A)

Explanation:

The message M is converted to message digest with the hash function H(M).

For authentication, the message digest must be encrypted with the private key of the sender which is Pr(A).

So encryption is Pr(A)H(M) which is received by the receiver.

The receiver will decrypt with the public key of A [[Py(A)]]

B Pr(B)H(M)

C Py(A)M

D Py(B)H(M)

Q.14)

Subject: computer organization

Max Marks: 1

Assume that we are having a computer with the following characteristics: 1MB of main memory; word size of 1 byte; block size of 16 bytes; and cache size of 64 KB. For the main memory addresses of FF010, the corresponding set number for a four-way set associative cache is\_\_\_\_\_

Correct Answer

Solution: (769)

Explanation:

Given that the cache size is = 64KB

One word= 1 Byte and each block contains=16 Bytes  $\Rightarrow$  16 words.

Number of cache lines=64KB/16B = 4K = 4096

Number of cache sets = 4096/4 = 1024

Size of the Main memory = 1MB

Total number of address bits are= 20 ( $2^{20} = 1M$ )

TAG	Set Index	Offset
6 (14-19)	10 (4-13)	4 (0-3)

Given memory address = FF010

$\Rightarrow$  1111 1111 0000 0001 0000

Offset =0000

Set Index = 11 0000 0001

TAG Bits are = 111111

Set Index is = 11 0000 0001  $\Rightarrow$  769 (mod 1024)  $\Rightarrow$  769<sup>th</sup> Set

Q.15)

Subject: operating systems

Max Marks: 1

We know that the paging scheme suffers from internal fragmentation.

S1 : If the CPU attempts to access the unused portion of the last page, the valid/invalid bits will block such accesses.

S2 : A possible solution to handle the internal fragmentation issue is to use multiple page sizes.

A S1 is True, S2 is False

B S1 is False, S2 is True

Correct Option

**Solution:** (B)

**Explanation:**

The valid / invalid bits cannot block all illegal memory accesses.

Due to the internal fragmentation in areas of memory in the last page that are not entirely filled by a process, and may contain data left over by whoever used that frame last.

Therefore, modern trends have been to have multiple size pages to try and make the best of both worlds.

**c**

\$1 is False, \$2 is False

**d**

None of the above

**Q.16)**

The equivalent simplified grammar for the following grammar is

$S \rightarrow aA \mid aBB$

$A \rightarrow aaA \mid \epsilon$

$B \rightarrow bB \mid bbC$

$C \rightarrow B$

**a**

$S \rightarrow aA \mid aBB \mid a$   
 $A \rightarrow aaA \mid aa$   
 $B \rightarrow bB \mid bb$

**b**

$S \rightarrow aA \mid aBB$   
 $A \rightarrow aaA \mid aa$   
 $B \rightarrow bB \mid bb$

**c**

$S \rightarrow aA \mid a$   
 $A \rightarrow aaA \mid aa$

Correct Option

**Solution:** (c)

**Explanation:**

**Elimination of Null Productions:**

$S \rightarrow aA \mid aBB \mid a$

$A \rightarrow aaA \mid aa$

$B \rightarrow bB \mid bbC$

$C \rightarrow B$

**Elimination of Unit Productions:**

$S \rightarrow aA \mid aBB \mid a$

$A \rightarrow aaA \mid aa$

$B \rightarrow bB \mid bbC$

$C \rightarrow bB \mid bbC$

**Elimination of Useless Symbols**

Variables B and C are not involved in the derivation of any string.

So we can eliminate the productions of B and C

$S \rightarrow aA \mid a$

$A \rightarrow aaA \mid aa$

**d**

$S \rightarrow aA$   
 $A \rightarrow aaA \mid aa$

**Q.17)**

Non-Left recursive grammar for the given grammar is

$S \rightarrow Sab \mid S! \mid (T) \mid bTb$

$T \rightarrow Ta \mid Tb \mid Tc \mid \epsilon$

**a**

$S \rightarrow (T) S' \mid bTb$   
 $S' \rightarrow abS' \mid !S' \mid \epsilon$   
 $T \rightarrow T'$   
 $T' \rightarrow aT' \mid bT' \mid cT' \mid \epsilon$

**b**

$S \rightarrow (T) \mid bTbS'$   
 $S' \rightarrow abS' \mid !S' \mid \epsilon$   
 $T \rightarrow T'$   
 $T' \rightarrow aT' \mid bT' \mid cT' \mid \epsilon$

**c**

$S \rightarrow (T) S' \mid bTbS'$

Correct Option

$S' \rightarrow abS' \mid IS' \mid \epsilon$   
 $T \rightarrow T'$   
 $T' \rightarrow aT' \mid bT' \mid cT' \mid \epsilon$

**Solution:** (c)

**Explanation:**

The given grammar is  
 $S \rightarrow Sab \mid S! \mid (T) \mid bTb$   
 $T \rightarrow Ta \mid Tb \mid Tc \mid \epsilon$

Non-Left recursive grammar for the given grammar is

$S \rightarrow (T) S' \mid bTbS'$   
 $S' \rightarrow abS' \mid !S' \mid \epsilon$   
 $T \rightarrow T'$   
 $T' \rightarrow aT' \mid bT' \mid cT' \mid \epsilon$

**D**

$S \rightarrow (T) S' \mid bTbS' \mid \epsilon$   
 $S' \rightarrow abS' \mid IS'$   
 $T \rightarrow T'$   
 $T' \rightarrow aT' \mid bT' \mid cT' \mid \epsilon$

**Q.18)**

Given two statements:

- S1:** A predicate is a (strictly Boolean-valued) function  
**S2:** A function is not necessarily, and usually not, a predicate.

Which of the above statement(s) is/are correct?

**Subject:** Discrete Mathematics

**Max Marks:** 1

**A**

Only S1 is True

**B**

S1 is True but S2 is False

**C**

Both S1 and S2 are False

**D**

None of the above

**Correct Option**

**Solution:** (D)

**Explanation:**

A predicate is a (strictly Boolean-valued) function, but a function is not necessarily, and usually not, a predicate.

A predicate takes one or more argument(s) and evaluates to a Boolean value: true, or false.

For  $x, y \in \mathbb{Z}$ ,  $x \leq y$ , is a predicate: its "output" is true, or false.

Functions takes of one or more "arguments" (elements) in a set (from the domain of the function) and assign a unique element of another set (which is the range of the function). Note, sometimes the domain is the same set as the range. Arguments of the domain and elements of the range are in the "domain of discourse."

**Q.19)**

Consider the following registers X and Y of a certain computer contains the decimal values 1024 and 4096. The effective address for the following instructions are

- I1. **STORE R1, 15(X,Y)**  
I2. **ADD - (X), R1**  
I3. **SUB (Y)+, R1**

**A**

5120, 1024, 4096

**B**

5135, 1023, 4096

**Subject:** computer organization

**Max Marks:** 1

**Solution:** (B)

**Explanation:**

Given X=1024 and Y=4096

I1. Addressing mode is Index -Two registers + Constant

Effective address for I1 is  $15 + 1024 + 4096 = 5135$

I2. Index -pre decrement

Effective address for I2 is 1023 (pre decrement decrements X and then uses it for the effective address)

I3. Index- Post Increment

Effective address for I3 is 4096 (post increment affects Y after effective address is computed)

c 5135, 1023, 4095

d 5120, 1024, 4095

Q.20)

What is the output of the following program

```
int main()
{
    int p, a[8] = {21, 32, 43, 54, 65, 76, 87, 98};
    p = (a + 2)[3];
    printf("%d\n", p);
    return 0;
}
```

A 43

B 54

C 65

D 76

Correct Option

Solution: (D)

Solution:

(a + 2)[3] will be interpreted as \*(a+2+3) which is the same as a[5]  
So the output is 76

Q.21)

What will be the output of the following code.

```
#include<stdio.h>
int main()
{
    int a = 5;
    switch(a)
    {
        Default: a = 4;
        case 6: a--;
        case 5: a = a+1;
        case 1: a = a-1;
    }
    printf("%d \n",a);
    return 0;
}
```

A Compilation Error

B 4

C 5

Correct Option

Solution: (C)

Solution:

Here a value is 5 so switch(5) will go to the case 5 then  
case 5:  
a = a+1; = 5+1 = 6 after this case there is no break statement so it will continue its execution to the last statement.  
case 1:  
a = a-1; = 6-1=5  
printf("%d \n",a); // so 5 will be printed here.  
So, the correct answer is 5.

D 6

Q.22)

In a new Addressing scheme, the Ip address uses 32 bit in which last two bits of 32 bits is the subnet bits and the starting four bits of the first octet are network bits rest of them are host bits. What is the Direct broadcast address(DBA) of the second subnet if one of the host address is 126.200.13.55? [ Note: The very first address will be considered as network id ]

A 127.255.255.254

Correct Option

Solution: (A)

Explanation:

126.200.13.55= 0111 1110.11001000.00001101.001101 11

Net bits

host bits

subnet bits

Subnet bits: 00 - network id  
 Subnet bits: 01 - First subnet  
 Subnet bits: 10 - Second subnet  
 For DBA all host bits are all one  
 Network bits will remain the same.  
 DBA address = 01111111.1111111.111111110 = 127.255.255.254

- B 127.255.255.255
- C 127.255.255.253
- D 126.255.255.249

Q.23)

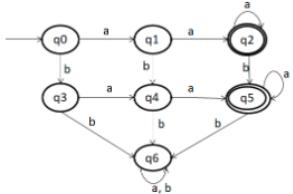
Number of states in a minimal DFA for the language  $L = \{ w \in \Sigma^* \mid n_a(w) \geq 2, n_b(w) \leq 1 \}$  is \_\_\_\_\_

Subject: Theory of Computation, Compiler Design

Max Marks: 1

Correct Answer

Solution: (?)  
**Explanation:**



Q.24)

The sum of the data, anti and output dependencies for the following sequence of instructions is \_\_\_\_\_

Subject: computer organization

Max Marks: 1

- I1: LOAD R1, 50(R2)
- I2: ADD R3, R1, R4
- I3: LOAD R5, 100(R3)
- I4: MUL R6, R5, R7
- I5: STORE R6, 50(R2)
- I6: ADD R1, R1, #100
- I7: SUB R2, R2, #8

Correct Answer

Solution: (3)  
**Answer:**  
**Explanation:**

**Data dependencies:**  
 Instruction 2 depends on instruction 1 for value R1  
 Instruction 6 depends on instruction 1 for value R1  
 Instruction 3 depends on instruction 2 for value R3  
 Instruction 4 depends on instruction 3 for value R5  
 Instruction 5 depends on instruction 4 for value R6

**Anti Dependencies:**  
 Instruction 6 is anti dependent on instruction 2 for access to R1  
 Instruction 7 is anti dependent on instruction 1 for access to R2  
 Instruction 7 is anti dependent on instruction 5 for access to R2

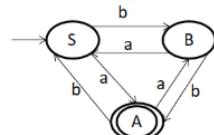
**Output dependencies:**  
 Instruction 6 has output dependence with instruction 1 for access to R1

Q.25)

The equivalent Right linear grammar for the given deterministic finite automata is

Subject: Theory of Computation, Compiler Design

Max Marks: 1



A  
 $S \rightarrow aA \mid bB$   
 $B \rightarrow bA \mid aS$   
 $A \rightarrow bS \mid aB$

B  
 $S \rightarrow aA \mid bB \mid a$   
 $B \rightarrow bA \mid aS \mid b$   
 $A \rightarrow bS \mid aB$

Correct Option

**Solution:** (B)

**Explanation:**

From the given DFA S is the initial state.  
 $\Rightarrow S$  is the start symbol of the grammar.  
S on a is going to A and on b is going to State B.  
 $S \rightarrow aA \mid bB$   
A is the final state, the grammar has to generate a  
 $\Rightarrow S \rightarrow aA \mid bB \mid a$   
 $A \rightarrow aB \mid bS$   
 $B \rightarrow aS \mid bA \mid b$   
B on reading b is going to final state. From state b will accept.

C  
 $S \rightarrow aA \mid bB \mid a$   
 $B \rightarrow bA \mid Sa \mid b$   
 $A \rightarrow bS \mid aB$

D  
 $S \rightarrow aA \mid bB$   
 $B \rightarrow bA \mid aS$   
 $A \rightarrow bS \mid Ba$

Q.26)

If you were given 3 data structures

Subject: Data Structures

Max Marks: 2



- a. A binary search tree of records (assume it is well balanced)
- b. A linked-list of records stored in order of insertion
- c. An array-based list of records maintained in sorted order(Inserting elements and then apply sorting procedure)

Suppose that you must first build a data structure holding  $2^{10}$  given elements, and then you must perform  $2^{20}$  searches on that data structure.

For each case, use the average case big- $\Theta$  time complexity results of each data structure to determine the costs associated with that data structure in this situation.

**Note that space cost is not a consideration. Cost is assumed to be in exact numbers.**

CASE	Cost of Insertion	Cost of $2^{20}$ Searches
a	I	II
b	III	IV
c	V	VI

Which of the following holds True?

A  
 $III < V = I < II = VI < IV$

B  
 $III < I = V < II = VI < IV$

C  
 $III < I = VI = II < V < IV$

D  
None of these

Correct Option

**Solution:** (D)

**Solution:** None of these

Answer is  $III < I < V < II = VI < IV$

CASE	Cost of Insertion	Cost of $2^{20}$ Searches
a	$I(10 \cdot 2^{10})$	$II(10 \cdot 2^{20})$
b	$III(2^{10})$	$IV(2^{29})$
c	$V(11 \cdot 2^{10})$	$VI(10 \cdot 2^{20})$

**BST:** Building costs  $n \log n$ , which would be  $2^{10} \log 2^{10} = 10 \cdot 2^{10}$ .

Assuming a balanced BST, each search costs on average  $\log n$ , which would be  $\log 2^{20} = 10$ .

$\log_2 10 = 4$ , so

the total cost of  $2^{10}$  searches would be  $10 \times 2^{10}$ .

**LL:** Building costs  $n$  or  $2^{10}$ , since each insertion has cost 1.

Search, on average costs  $n/2$  or  $2^9$ , and so the total cost of  $2^{10}$  searches would be  $2^{29}$ .

**SA:** Building cost depends on the method you assume.

Inserting the elements into an array and then sorting efficiently would cost  $n + n \log n$ , which would be  $2^{10} + 2^{10} \log 2^{10}$  or  $10 \times 2^{10} + 2^{10} = 11 \times 2^{10}$ .

Each search would have cost  $\log n$ , or  $\log 2^{10} = 10$ . So the total cost of all the searches would be  $10 \times 2^{10}$ .

Q.27)

Subject: digital logic systems

Max Marks: 2



Given a function  $F(W, X, Y, Z) = \sum(0, 2, 3, 6, 7, 8, 10)$  is realized by the following variable entrant map.

WXY	00	01	11	10
0	A	1	C	0
1	B	Z'	D	E

Which of the following is correct for the values of A, B, C, D and E?

A

$A = B = Z'$ ,  $C = 1$ ,  $D = E = 0$

Correct Option

Solution: (A)

Solution:

For the given function the Truth Table will be:

W	X	Y	Z	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Based on this grouping, the reduced table with F in terms of Z will be:

W	X	Y	F
0	0	0	$Z'$
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	$Z'$
1	0	1	$Z'$
1	1	0	0
1	1	1	0

The k-map for the reduced table will be:

WXY	00	01	11	10
0	$Z'$	1	1	0
1	$Z'$	$Z'$	0	0

Hence, the correct option is  $A = B = Z'$ ,  $C = 1$ ,  $D = E = 0$

B

$A = Z'$ ,  $B = C = 1$ ,  $D = E = 0$

**C** A = B = Z, C = 0, D = E = 1

**D** A = B = 1, C = 0, D = E = Z

**Q.28)**

Given below are two statements:

**S1 :** If a Graph G is n colorable then it's also n+1 colorable .

**S2 :** Every Bipartite graph is 2 colorable

Which of the above statement(s) is/are correct?

**A** Only S1 is false

**B** Only S2 is true

**C** Both S1 and S2 are true

Correct Option

**Solution:** (C)

**Explanation:**

S1: Consider a graph that is  $k$ -colored. Choose any one vertex of the graph and replace its color by a new  $(k+1)^{\text{th}}$  color. Clearly, the graph is still properly colored.

Note: If a graph is  $k$ -colorable, then it is also  $(k+n)$ -colorable,  $n \geq 1$

Another thing worth noticing is that a graph is 1-colorable if and only if it is totally disconnected, that is all its vertices are isolated.

**S2 : Assuming by null graph we mean an empty graph ( i.e., a graph is having no edges) then, the graph is trivially bipartite as we can partition the vertex set into 2 disjoint sets without restriction.**

**A graph is bipartite if and only if it is 2-colorable, (i.e. its chromatic number is less than or equal to 2).**

**D** None of the above

**Q.29)**

If the time complexity of an algorithm is given by the following recurrence relation then the time complexity for the same algorithm for an input size of  $2n$  is given by

$T(n)=2^nT(n/2)+2^n$

**A**  $O(4^n \log n)$

**B**  $O(2^n \log n)$

**C**  $O(4^n)$

**D** None of the Above

Correct Option

**Solution:** (D)

$T(n)=2^nT(n/2)+2^n$

Solving by Substitution Method

$$=2^n(T(n/2)+1)$$

$$=2^n(2^{\frac{n}{2}}T(n/4)+1)$$

$$=2^n(2^{\frac{n}{2}}(T(n/4)+1)+1)$$

$$=2^n(2^{\frac{n}{2}}(2^{\frac{n}{4}}(T(n/8)+1)+1)+1)$$

On simplification it reduces to

$$=2^{n+\frac{n}{2}+\frac{n}{4}+\frac{n}{8}+\frac{n}{16}+\dots+\frac{n}{2^k}} T(1) + 2^{n+\frac{n}{2}+\frac{n}{4}+\frac{n}{8}+\frac{n}{16}+\dots+\frac{n}{2^{k-1}}} + 2^{n+\frac{n}{2}+\frac{n}{4}+\frac{n}{8}+\frac{n}{16}+\dots+\frac{n}{2^{k-2}}} + \\ 2^{n+\frac{n}{2}+\frac{n}{4}+\frac{n}{8}+\frac{n}{16}+\dots+\frac{n}{2^{k-3}}} + \dots + 2^{n+\frac{n}{2}+\frac{n}{4}} + 2^{n+\frac{n}{2}} + 2^n$$

The term of the highest order here is the first term

$$=2^{n+\frac{n}{2}+\frac{n}{4}+\frac{n}{8}+\frac{n}{16}+\dots+\frac{n}{2^k}} T(1)$$

$$=2^{n(1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\dots+\frac{1}{2^k})} T(1) \text{ -----equation 1.}$$

The exponent here forms a G.P. here  $k = \log_2 n$

$$=n(1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{2^{\log_2 n}})$$

$$\text{Sum of the GP} = \frac{n(1 - \frac{1}{2^{\log_2 n}})}{(1 - \frac{1}{2})}$$

$$= \frac{n(1 - \frac{1}{2^{\log_2 n}})}{(1 - \frac{1}{2})} \text{ as } 2^{\log_2 n} = n. \text{ (here log is base 2)}$$

$$= \frac{n(1-\frac{1}{2})}{(1/2)} = 2 * (n - 1)$$

Substituting back in equation1 we get

$$= 2^{2(n-1)} T(1)$$

$$= 4^n T(1)$$

Taking T(1) as a constant we get  $T(n)=O(4^n)$

for an input size of  $2n$  we require

$$= O(4^{2n})$$

$= O(16^n)$ . Therefore option D is correct.

Q.30)

We are given a one-level paging system, where 90% of the times there is a TLB Hit.

The time required to access the TLB is 5 ns. And to access main memory, it takes 95 ns.

Page fault rate is 5% out of the total references. The service time for a page fault is 1 ms.

Find the EAT (with page fault)

Subject: operating systems

Max Marks: 2

Note:  $5 * 10^4$  ns approx is not available in the options marks will be awarded to all the participants.

A

$$5 * 10^6 \text{ ns}$$

Correct Option

Solution: (A)

Explanation:

Effective Access Time with page fault =

$$\text{Page fault rate} * \{\text{Effective Access Time without page fault} + \text{Page fault service time}\} \\ + (1 - \text{Page fault rate}) * \{\text{Effective Access time without page fault}\}$$

Where,

Effective Access Time without page fault =

$$\text{Hit ratio of TLB} * \{\text{Access time of TLB} + \text{Access time of main memory}\} \\ + \text{Miss ratio of TLB} * \{\text{Access time of TLB} + (L + 1) * \text{Access time of main memory}\}$$

and,

L = Number of levels of page table.

TLB Hit Ratio = 90%

TLB Access Time = 5 ns

L = 1

MMAT = 95 ns

Page fault rate = 5% out of total references

PFST = 1 ms =  $1 * 10^6$  ns

Therefore, we get,

Effective Access Time without page fault

$$= 90/100(5 \text{ ns} + 95 \text{ ns}) + 10/100(5 \text{ ns} + 2 * 95 \text{ ns})$$

$$= 0.9(100\text{ns}) + 0.1(195 \text{ ns})$$

$$= 90 \text{ ns} + 19.5 \text{ ns}$$

$$= 109.5 \text{ ns}$$

And Effective Access Time with page fault

$$= 5/100(109.5 \text{ ns} + 10^6 \text{ ns}) + 95/100(109.5 \text{ ns})$$

$$= 5 * 1.095 \text{ ns} + 5 * 10^4 \text{ ns} + 95 * 1.095 \text{ ns}$$

$$= 5 * 10^4 \text{ ns approx.}$$

B

$$10 * 10^5 \text{ ns}$$

C

$$5 * 10^5 \text{ ns}$$

D

$$10 * 10^6 \text{ ns}$$

Q.31)

Which of the following statements is/are True

- I. If  $L_1$  and  $L_2$  are nonregular languages, then  $L_1 \cup L_2$  is also not regular
- II. If  $L_1$  and  $L_2$  are nonregular languages, then  $L_1 \cap L_2$  is also not regular

A

I Only

B

II Only

C

I and II Only

D

Neither I nor II

Subject: Theory of Computation, Compiler Design

Max Marks: 2

Correct Option

Solution: (D)

Explanation:

- I. If  $L_1$  and  $L_2$  are nonregular languages, then  $L_1 \cup L_2$  is

- also not regular  
 False. Let  $L_1 = \{a^n b^m, n \geq m\}$  and  $L_2 = \{a^n b^m, n \leq m\}$ .  
 $L_1 \cup L_2 = a^* b^*$ , which is regular.
- II. If  $L_1$  and  $L_2$  are nonregular languages, then  $L_1 \cap L_2$  is also not regular  
 False. Let  $L_1 = \{a^n b^m, n = m\}$  and  $L_2 = \{b^n c^m, n=m\}$ .  
 $L_1 \cap L_2 = \{\}$ , which is also regular.

Q.32)

The host wants to map with the hostname using Domain name system(DNS).

Subject: Computer Networks

Max Marks: 2

The resolver sends the query to the local DNS server.  
 If local DNS fails to answer then the local DNS server sends the query to the root server.  
 If Root server fails then the query is forwarded to the authoritative server which is the last level server.

The reply of the DNS query is recursive which will pass through all the servers again and reaches to host with negligible propagation, processing and other delays. The average access time for fetching a query is 3ns. All the server takes 2ns of access time. If 60% of the time we find the results in the local DNS server. The last level server always has the answer. What percentage of time we will find the results in the root server?

Correct Answer

Solution: (75)

**Explanation:**Hit ratio of local dns server ( $H_1$ ) = 0.6

Hit ratio of root server = ?,

Hit ratio of authoritative server = 1,

Access time= $T_1=T_2=T_3=2$ ns, $T_{avg} = 3$ ns

$$T_{avg} = H_1 T_1 + (1-H_1)H_2 (T_1+T_2) + (1-H_1)(1-H_2)H_3(T_1+T_2+T_3)$$

$$3 = 0.6 \times 2 + (0.4)H_2(4) + (0.4)(1-H_2)1(6)$$

$$H_2 = 0.75 = 75\%$$

Q.33)

Consider the given lists.

Subject: DBMS

Max Marks: 2

List I	List II
1. Strict 2 PL protocol	a. Irrecoverable
2. Timestamp ordering protocol	b. Recoverable
3. 2 PL protocol	c. Deadlock
4. Conservative 2 PL protocol	d. Deadlock free

Which of the following is correct about above matching of the lists?

A

Matching-A: 1 - b, 2 - a, 3 - c, 4 - d

B

Matching-B: 1 - c, 2 - a, 3 - d, 4 - b

C

Matching-C: 1 - c, 2 - d, 3 - a, 4 - b

D

Both Matching(A) and Matching(C)

Correct Option

Solution: (D)

Solution:

Both (i) and (iii) are valid matching for list I and II.

2 PL protocol only ensures/guarantees serializability. Hence, a schedule having 2 PL protocol could have both deadlock as well as irrecoverability. Therefore, number 3 could be either "a" or "c".

Strict 2 PL guarantees both serializability as well as strict recoverability. But it does not guarantee deadlock. Hence, number 1 can take values "b" or "c".

TSP (timestamp ordering protocol) guarantees serializability and deadlock free schedule. But it does not guarantee recoverability. Hence, number 2 can take value "a" or "d".

Conservative 2 PL guarantees serializability and recoverability as well as deadlock free schedule. Hence, number 4 can take value "b" or "d".

	Irrecoverable	Recoverable	Deadlock	Deadlock free
Strict 2 PL	No	Yes	Yes	No

Timestamp ordering protocol	Yes	No	No	Yes
2 PL protocol	Yes	No	Yes	No
Conservative 2 PL protocol	No	Yes	No	Yes

Q.34)

Which of the following languages are Context free languages

- $C = \{xy \mid x, y \in \{0, 1\}^*, |x| = |y|, \text{ and } x \neq y\}$
- $A = \{wtw^R \mid w, t \in \{0, 1\}^* \text{ and } |w| = |t|\}$

 A

I only

Correct Option

Solution: (A)

**Explanation:**

- $C = \{xy \mid x, y \in \{0, 1\}^*, |x| = |y|, \text{ and } x \neq y\}$  CFL  
We observe that a string is in C if and only if it can be written as xy with  $|x| = |y|$  such that for some i, the ith character of x is different from the  $i^{th}$  character of y. To obtain such a string, we start generating the corresponding  $i^{th}$  characters, and fill up the remaining characters. Based on the above idea, we define the CFG for C is as follows:

$$\begin{aligned} S &\rightarrow AB \mid BA \\ A &\rightarrow XAX \mid 0 \\ B &\rightarrow XBX \mid 1 \\ X &\rightarrow 0 \mid 1 \end{aligned}$$

- $A = \{wtw^R \mid w, t \in \{0, 1\}^* \text{ and } |w| = |t|\}$  Non-CFL  
We need more than one stack to prove that length of string w is equal to the length of string y and w is repeated as  $w^R$ .

 B

II only

 C

Both I and II

 D

Neither I nor II

Q.35)

The value of f(0) so that  $f(x) = \frac{3x+4\sec x}{x}$  is continuous at x=0 is

Subject: Engineering-Mathematics

Max Marks: 2

 A

5

 B

6

 C

7

Correct Option

Solution: (C)

Solution:

If  $f(x)$  is continuous then the left-hand limit at  $x=0$ =right hand limit at  $x=0=f(0)$ .

$$\lim_{x \rightarrow 0^-} \frac{3x+4\sec x}{x}$$

$$\lim_{x \rightarrow 0^-} \frac{3+4\sec^2 x}{1} = 7$$

$$\lim_{x \rightarrow 0^+} \frac{3x+4\sec x}{x}$$

$$\lim_{x \rightarrow 0^+} \frac{3+4\sec^2 x}{1} = 7$$

The value of the function for which will make it continuous at  $x=0$   $f(0)=7$ .



None of the above

Q.36)

Consider the following schema of relation R (WXYZ):

Subject: DBMS

Max Marks: 2



W	X	Y	Z
1	1	1	1
2	3	4	1
1	4	1	2
2	2	4	2
3	5	3	1

Which of the following statements is correct about above relation R?

- I. YZ and WZ are the possible candidate keys of R.
- II. XY  $\rightarrow$  WZ, where XY is a candidate key of R.



Only I

Correct Option

Solution: (A)

Solution:

- I. Since, YZ and WZ can uniquely determine each tuple of R, therefore both of them are possible candidate keys of relation R.
- II. X is a candidate key of R while XY is a superkey of R. Hence, this statement is incorrect.



Only II



Both I and II



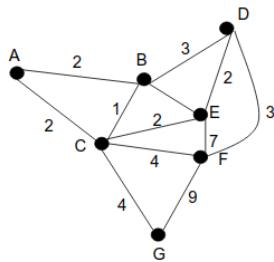
Neither I nor II

Q.37)

Consider the following graph, if Dijkstra's single-source shortest path algorithm is applied which if the following is not the order of relaxation.

Subject: Algorithms

Max Marks: 2



Note: Note: Edge weight between the vertices B,E marks will be assigned to all the participants.



A, B, C, E, D, G, F.



A, B, C, E, D, F, G.



A, C, B, E, D, G, F.



None of the above.

Correct Option

Solution: (D)

Solution D.

1. Initially, A is removed from the min-heap
- B and C are relaxed.
- B.d=2
- C.d=2
- Either B or C can be removed from the min-heap.
- If B is removed
- D and E are relaxed
- D.d=5
- E.d=8
- C is removed form the min heap
- G and H are relaxed
- G.d=6
- F.d=6
- E is not removed from the min-heap
- No vertices are relaxed.
- D is not removed from the min-heap
- vertices
- Either F or G can be removed from the min-heap.

**Let's take F.**  
No vertices are relaxed.

7. G is removed from the min-heap.  
No vertices are relaxed.

The order of relaxation, in this case, is A, B, C, E, D, G, F.  
In the 6th step if we take F we will get the order A, B, C, E, D, F, G.  
Another possibility is at step 2 if we consider C to be removed from the min-heap we will get A, C, B, E, D, G, F.  
Therefore all the options are valid and none of the above is the correct option.

Q.38)

Subject: Computer Networks

Max Marks: 2



A bit stuffing based framing protocol uses an 8-bit of delimiter pattern. Here we are using multiple delimiters on the same input string because of some security reasons. The delimiter can hold any value from the regular expression  $(0111 + 1110)^2$ . In the given options, which of the following methods can be possible to do bit stuffing in the input string?



Stuff 0 after four ones.



Stuff 0 after three ones.



Stuff 0 after two ones.

Correct Option

Solution: (c)

#### Explanation:

Reg expression= $(0111 + 1110)^2$  = All outcomes = { 01110111, 01111110, 11101110, 11100111} = These are four delimiter pattern.

Option a stuff 0 after four ones – Won't be able to differentiate delimiter 1,3,4 in input string because they won't contain 4 ones.

Option b stuff 0 after three one's- 2<sup>nd</sup> delimiter will look like the first delimiter, therefore, it won't help to uniquely identify delimiter in data.

Option c stuff 0 after two ones- All the delimiters will satisfy if we stuff 0 after two ones, In the input string, we can uniquely differentiate all the delimiters.

Option d stuff 1 after five ones- only 2<sup>nd</sup> delimiter we can differentiate from the input string.



Stuff 0 after five ones.

Q.39)

Subject: DBMS

Max Marks: 2



Consider the set of relations shown below and the SQL query that follows.

Movies (Movie\_id, Title, Year, Rating, Num\_rating)  
Movie\_Cast(Movie\_id, Name, Position\_of\_cast)

Note: Position of the cast is the order of the actor where he/she appears in the list of cast.

The query is:

CREATE VIEW Number

AS

```
SELECT Movie_id FROM Movie_Cast  
GROUP BY Movie_id  
HAVING COUNT(*) >= ALL (SELECT COUNT(*)  
FROM Movie_Cast GROUP BY Movie_id);  
SELECT Number.Movie_id, title FROM Number, Movies WHERE Number.Movie_id =  
Movies.Movie_id ORDER BY Movie_id;
```

Which of the following is true about the above query?



Return the Movie\_id and title of the movies that employed the largest number of actors.



Return the Movie\_id and title of the movies that employed the largest number of actors in the ascending order.



Return the Movie\_id and title of the movies that employed the largest number of actors. The Movie\_id are present in ascending order in case, if there is tie.

Correct Option

Solution: (c)

#### Solution:

The query creates a virtual table named as "Number" and selects the Movie\_id's which have the largest number of actors.

The inner query return the count\* of all the cast members in Movie, while the outer query will print all those Movie\_id whose that employed the largest number of actors (As ALL clause will return true iff all of the subqueries meet the condition)

The second part of the query returns the attribute, Movie\_id and title of the movie from the relation Number and Movies. Since there is the use of ORDER BY clause over Movie\_id; therefore, if there is a tie in Movie\_id, they will be printed in ascending order.

D None of the above.

Q.40)

Which of the following is/are True

- I. If  $A \leq_m B$  and  $B$  is Turing-decidable, then  $A$  is Turing-decidable
- II. If  $A \leq_m B$  and  $A$  is undecidable, then  $B$  is undecidable.
- III. If  $A \leq_m B$  and  $A$  is not Turing-recognizable, then  $B$  is not Turing-recognizable.

A I Only

B I and II Only

C II and III Only

D I,II and III Only

Correct Option

Solution: (D)

**Explanation:**

- I. If  $A \leq_m B$  and  $B$  is Turing-decidable, then  $A$  is Turing-decidable. True
- II. If  $A \leq_m B$  and  $A$  is undecidable, then  $B$  is undecidable. True
- III. If  $A \leq_m B$  and  $A$  is not Turing-recognizable, then  $B$  is not Turing-recognizable. True

Q.41)

A divide and conquer based approach is being used to count the number of inversions, the number of inversions is a metric of how much far away an array is from completely being sorted. A modification in merge sort helps in counting the number of inversions in  $O(N \log N)$  time. Consider the following array of elements 8, 10, 15, 9 the element 9 should have come before 10 therefore (10, 9) is an inversion, similarly (15, 9) is also an inversion, these are the only two inversions present in this array.

Subject: Algorithms

Max Marks: 2

```

int mergeSort(int arr[], int temp[], int left, int right)
{
    if (right > left)
    {
        mid = (right + left) / 2;
        left_inv_count = mergeSort(arr, temp, left, mid);
        right_inv_count = mergeSort(arr, temp, mid + 1, right);
        merge_count=merge(arr, temp, left, mid + 1, right);
        inv_count= _____ //Blank A
    }
    return inv_count;
}
int merge(int arr[], int temp[], int left, int mid, int right)
{
    int i,j,k;
    int inv_count = 0;
    i=left;
    j=mid;
    k=left;
    while ((i <= mid - 1) && (j <= right))
    {
        if (arr[i] <= arr[j])
        {
            temp[k++]=arr[i++];
        }
        else
        {
            temp[k++]=arr[j++];
            inv_count = _____ //Blank B
        }
    }
    while (i <= mid - 1)
        temp[k++]=arr[i++];
    while (j <= right)
        temp[k++]=arr[j++];
    for (i = left; i <= right; i++)
        arr[i] = temp[i];
    return inv_count;
}

```

Which of the following should be used for the blanks at locations A and B.

A

inv\_count = left\_inv\_count+ right\_inv\_count  
inv\_count = inv\_count + (mid - i)

**Q.41**

Given two sorted arrays of size  $n$  each. The task is to find the number of inversions in the merged array. An inversion is defined as a pair  $(i, j)$  such that  $i < j$  and  $a[i] > a[j]$ .  
**Solution:** (D)

**Explanation:**  
**Blank A**  
When we merge 2 arrays then no of inversions of two sorted, once they are merged then the no of inversions is the sum of the no of inversions in the left subarray and right sub-array and the no of inversions in between the two sub-arrays.  
**For example**  
Array 1: 3,4  
Array 2: 2,1  
# of inversions in Array1(3,4)=1  
# of inversions in Array2 (2,1)=1  
When we combine both of them total no of inversions = Combined Array=3, 4, 2,1  
(3,4), (2,1) original inversions + (3,2), (3,1), (4,2), (4,1) which are inversions across the two arrays where the first element belong to the first array and the second element of the inversion belongs to the second array.  
**Blank B**  
In merge process, let  $i$  is used for indexing left sub-array and  $j$  for right sub-array. At any step in merge(), if  $a[i]$  is greater than  $a[j]$ , then there are  $(mid - i)$  inversions. because left and right subarrays are sorted, so all the remaining elements in left-subarray ( $a[i+1], a[i+2] \dots a[mid]$ ) will be greater than  $a[j]$ .

**Correct Option**

**Q.42**

Consider the following given C code snippet

```
int foo(int a, int b)
{
    return b ^ ((a ^ b) & -(a < b));
}
```

What is the above function foo doing?

**A** Returns sum of two elements

**B** Returns maximum element of two numbers

**C** Returns minimum element of two numbers

**D** None of the above

**Solution:** (C)

**Solution:**  
Minimum of a and b will be  
 $b ^ ((a ^ b) & -(a < b))$   
It works because if  $a < b$ , then  $-(a = b)$ , then  $-(a < b)$  will be all zeros, so  $r = b ^ ((a ^ b) & 0) = b$ . On some machines, evaluating  $(x < y)$  as 0 or 1 requires a branch instruction, so there may be no advantage.

**Example:**  
 $a = 2$   
 $b = 3$   
 $a \wedge b = 1$   
 $-(a < b) = -1$   
 $1 \wedge -1 = 1$   
 $3 \wedge 1 = 2$  which is a minimum of two numbers

**Correct Option**

**Q.43**

Given a 16-bit register used for storing a floating point number. The mantissa (M) is represented as normalised sign magnitude fraction while exponent (E) is expressed in excess 64 format. The bit pattern of two numbers X and Y is given as:  
**X:**

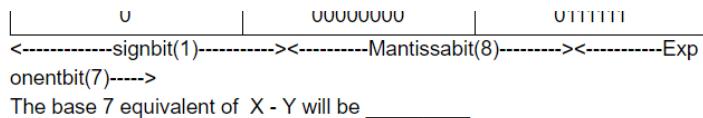
0	11100000	1000010
---	----------	---------

<-----signbit(1)-----><-----Mantissabit(8)-----><-----Exponentbit(7)----->

**Y:**

^	~~~~~	~~~~~
---	-------	-------

**Subject: digital logic systems**    **Max Marks: 2**



The base 7 equivalent of X - Y will be \_\_\_\_\_

**Correct Answer**

**Solution:** (10)

**Solution:** 10

For X:

Normalised representation is:  $(-1)^s \times (1.M) \times 2^{E-64}$

Exponent: 1000010 = 66

Therefore, it will be:

$\Rightarrow (-1)^0 \times (1.11100000) \times 2^{66-64}$

$\Rightarrow 1.111 \times 2^2$

$\Rightarrow 111.1$

$\Rightarrow 7.5$

For Y:

Normalised representation is:  $(-1)^s \times (1.M) \times 2^{E-64}$

Exponent: 0111111 = 63

Therefore, it will be:

$\Rightarrow (-1)^0 \times (1.00000000) \times 2^{63-64}$

$\Rightarrow 1.00000000 \times 2^{-1}$

$\Rightarrow 0.1$

$\Rightarrow 0.5$

Hence,  $X - Y = 7.5 - 0.5 = 7_{10}$

Base-7 equivalent of 7 will be 10. Hence, the answer is 10.

**Q.44)**

**Subject: Computer Networks**

**Max Marks: 2**

In the TCP we are using AIMD for congestion control, assume that after every fourth transmission timeout occurs. The slow start phase always starts with 1 MSS (maximum segment size) and the initial threshold window size is 8 MSS. What will be the threshold value (in MSS) when the threshold become constant? [ Note: Always take a floor value if your threshold is in decimal.]

**Correct Answer**

**Solution:** (2)

**Explanation:**

Initial threshold = 8 MSS

First transmission: 1 MSS

Second Transmission: 2 MSS

Third transmission: 4 MSS

Forth transmission: 8 MSS [ Timeout , Threshold = 8 MSS/2 = 4 MSS ]

Fifth Transmission: 1 MSS

Sixth Transmission: 2 MSS

Seventh Transmission: 4 MSS [ Threshold reached ]

Eighth Transmission: 5 MSS [ Timeout , Threshold=5/2 = 2.5 MSS = 2 MSS ]

Ninth transmission: 1 MSS

Tenth Transmission: 2 MSS [ Threshold reached ]

Eleventh transmission: 3 MSS

Twelfth transmission: 4 MSS [ Timeout, Threshold = 4/2 = 2 MSS ]

Thirteenth transmission: 1 MSS

Fourteenth transmission: 2 MSS [ Threshold reached ]

Fifteenth transmission: 3 MSS

Sixteenth transmission: 4 MSS [ Timeout , th = 4/2= 2 MSS ]

In twelfth and sixteenth transmission threshold value = 2 MSS which is constant.

Afterwards, after every fourth transmission timeout, the threshold value will remain constant which is 2 MSS

**Q.45)**

**Subject: operating systems**

**Max Marks: 2**

A student has tried to modify the Peterson's algorithm:

int turn;

Boolean flag[2] = {False};

P0

P1

```

flag [0] = True;           flag[1] = True;
turn = 1;                  turn = 0;
while(flag[1] && turn != 0); while(flag[0] && turn != 1);
CS                      CS
flag[1] = False;          flag[0] = False;

```

Which of the following is true?

Note: 'None of the above' option is not available in the options, marks will be awarded to all the participants.

**A** M.E is satisfied

**B** Progress is satisfied

Correct Option

**Solution:** (B)

**Explanation:**

**Please note that:**

1.

flag[i] indicates position of  $P_i$  with respect to mutual exclusion

2.

turn resolves simultaneity conflicts

3.

some process sets turn last (before entering the while test)

#### **M.E is not satisfied**

1) Suppose  $P_1$  enters first making  $\text{flag}[1]=\text{true}$  and  $\text{turn}=0$ .

2) Now  $P_1$  will cross the while loop and will enter the CS because  $\text{flag}[0]$  is false.

3) Now  $P_1$  preempts.

4) Now  $P_0$  enters making  $\text{flag}[0]=\text{true}$  and  $\text{turn}=1$ ;

5) Now  $P_0$  will get into infinite while loop because  $\text{flag}[1]$  is true and  $\text{turn}=0$ .

6) Now  $P_0$  preempts.

7) Now  $P_1$  gets out of CS making  $\text{flag}[0]=\text{false}$ ;

8) Again  $P_1$  executes and makes  $\text{flag}[1]=\text{true}$  and  $\text{turn}=0$ ;

9) Now again  $P_1$  will cross while loop because  $\text{flag}[0]$  is false as made in statement (7) and enters CS.

10) Now  $P_1$  preempts.

11) Now  $P_0$  is in while loop but it will now cross while loop because  $\text{turn}=0$  as made in statement (8) by  $P_1$ .

12) Now  $P_0$  will enter into CS.

So now both the process is in CS, so mutual exclusion is not satisfied.

#### **Progress**

Suppose  $P_1$  is not interested to execute its CS. Then  $\text{flag}[1] = \text{False}$ .

To check for progress condition, we will see if a process in its Non CS section is stopping a process interested to execute its CS.

So,  $P_0$  makes  $\text{flag}[0] = \text{True}$ , then makes  $\text{turn} = 1$ . Since  $\text{flag}[1] = \text{False}$ ,  $P_0$  enters its CS and executes its CS. While exiting CS,  $P_0$  updates  $\text{flag}[1]$  to False again. Likewise,  $P_0$  can continue to execute CS without any intervention from the non-interested process  $P_1$ .

Therefore, here progress condition is satisfied.

Suppose if  $P_1$  enters the critical section and left and is not interested for CS again, then  $\text{flag}[1]$  will be true. Now, if  $P_0$  wants to execute it will check that  $\text{flag}[1]$  is true and it will get stuck in the while loop, which proves that progress is not satisfied.

#### **Bounded Waiting:**

Also Bounded waiting is not satisfied because if  $P_1$  wants to enter CS again and again it can do it because every time it gets out of CS it will make  $\text{flag}[0]=\text{false}$  and will never stuck in while loop.

**C** Bounded waiting is satisfied

**D** All of the above

Q.46)

Consider the following grammar where T is the start symbol:

$T \rightarrow B \mid \{L\}$

$L \rightarrow TL \mid B$

$B \rightarrow a \mid b$

Let  $I_0 = \text{CLOSURE } (\{[T' \rightarrow \cdot T]\})$ . The number of productions/items in the set GOTO ( $I_0, \{ \}$ ) is: \_\_\_\_\_.

Subject: Theory of Computation, Compiler Design

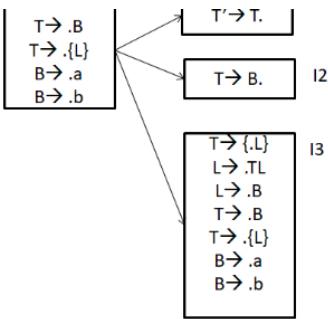
Max Marks: 2

Correct Answer

**Solution:** (?)

**Explanation:**





GOTO ( $I_0, \{ \}$ ) = I3  $\Rightarrow$  Number of items = 7

Q.47)

Subject: Data Structures

Max Marks: 2

Consider the standard algorithm for converting a decimal number (base 10) into a binary number (base 2). This algorithm makes use of a single stack and works by continually taking the modulo 2 of the number and also continually dividing it by two. This allows us to finally obtain the bits of the integer. The number of times n a number has to be pushed to this stack in order to be fully converted can be expressed as a function f(n). What is f(n)?

A logn

Correct Option

Solution: (A)

#### Solution:

The standard algorithm for converting a decimal number to binary is the following.

1. Input a number N
2. Initialize a stack S.
3. Start loop. While N does not equal 0
  - Digit = N % 2
  - Push Digit to S
  - Divide N by 2. N = N/2
4. Print the items in the stack in reversed order. The output is the binary representation of N

Since N is being continuously divided by 2 until it equals 0, we see that the loop runs  $\text{floor}(\log_2^n) + 1$

B  $n^2$

C  $n^3$

D  $2^n$

Q.48)

Subject: Engineering-Mathematics

Max Marks: 2

Three boxes numbered I, II, III contain balls as follows

Box\Color	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. The probability that it is from box II is \_\_\_\_\_.

A  $1/2$

B  $1/3$

Correct Option

Solution: (B)

#### Solution B

Since we do not know anything about the outcome of the ball if it is white, black or red and the choice of the box is done randomly all three boxes have equal probability  $P(\text{Box I})=P(\text{Box II})=P(\text{Box III})$ .

Also  $P(\text{Box I})+P(\text{Box II})+P(\text{Box III})=1$

Therefore  $P(\text{Box II})=\frac{1}{3}$ .

C  $1/4$

D  $1/9$

Q.49)

Subject: Discrete Mathematics

Max Marks: 2

Given algebraic structure  $(\Sigma^*, \cdot)$  where,  $\Sigma = \{0,1\}$  and  $\cdot$  is concatenation.

Which of the following is not correct?

A  $\Sigma^*$  is a semi group

B  $\Sigma^*$  is a monoid

C  $\Sigma^*$  is a group

Correct Option

Solution: (C)

Explanation:

$\Sigma^*$  is closed.

Test for associativity:

$$a.(b.c) = (a.b).c$$

$$0.(1.0) = (0.1).0$$

$$010 = 010$$

Hence Semi Group.

Test for identity element:

We have an identity element 'epsilon'.

$$a \cdot \text{epsilon} = a$$

$$11 \cdot \text{epsilon} = 11$$

Hence monoid.

Test for inverse:

No inverse exists such that,

$$a \cdot a^{-1} = a^{-1} \cdot a = \text{epsilon}$$

There are no inverse for string concatenation because the inverse of a non empty string does not exist under concatenation of strings. Hence it is a monoid.

D  $\Sigma^*$  is not an abelian group

Q.50)

Subject: computer organization

Max Marks: 2

Consider the following sequence of instructions:

1. LOAD F4, 16(R2)

2. LOAD F6, 48(R2)

3. MUL F10, F4, F8

4. ADD F8, F10, F6

5. STORE F8, 0(R3)

The number of stall cycles during the execution of these instructions on the regular 5 stage pipelined processor is \_\_\_\_\_. (Assume that the pipeline stages are IF, ID, EX, MEM, WB)

Correct Answer

Solution: (5)

Explanation:

Assume that the pipeline stages are IF, ID, EX, MEM, WB

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I1	I F	I D	E X	M E M	W B										
I2		IF	ID	EX	ME M	W B									
I3			IF	-	ID	E X	ME M	W B							
I4					IF	-	-	ID	E X	M E M	W B				
I5								IF	ID	-	-	E X	M E M	W B	

Number of cycles to complete is 14 and the stall cycles are 5.

Q.51)

Subject: computer organization

Max Marks: 2

Consider the following code fragment

```
int x = 0, y = 0; // The compiler puts x in r1 and y in r2.
```

```
int i; // The compiler put i in r3.
```

```
int A[4096]; // A is in memory at address 0x10000 ...
```

```
for (i=0; i<1024; i++)
```

```
{
```

```
    x += A[i];
```

```
}
```

Consider that the system has a 8192-byte, direct-mapped data cache with 16-byte blocks. Assuming that the cache starts out empty, the total number of hits for the data cache is \_\_\_\_\_. Assume that ints are 32-bits.

**Solution:** (768)**Explanation:**Given cache size is  $8192B \Rightarrow 2^{13}B$ Each cache line contains  $16B \Rightarrow 2^4B$ Number of cache lines =  $2^{13}/2^4 = 2^9 = 512$ Int = 32 bits  $\Rightarrow 4B$  each element sizeNumber of elements can be stored in each cache line/ Block =  $16B/4B = 4$ 

We are trying to access the elements

A[0], A[1], A[2], .....

A[0] it is a Miss, as initially cache is empty.

A block is taken from the main memory and placed in the cache.

A[1] is a hit

A[2] is a hit

A[3] is a Miss

A[4] is a Hit

A[5] is a Hit

A[6] is a Hit

A[7] is a Hit.....

For each of the four elements one miss and 3 hits.

Total number of misses are  $1024/4 = 256$ 

Total number of hits are = 768

**Q.52)**

Subject: Discrete Mathematics

Max Marks: 2



Consider the following statements:

S1 : K-regular graph is always a complete graph because min degree=max degree. And in K-regular graph we can visit every vertex exactly once.

S2 : A hamiltonian cycle is one in which we will visit all the vertices exactly once. The edges may or may not be repeated.

Which of the above statement(s) is/are correct?



S1 is not True, S2 is not False



S1 is False, S2 is True



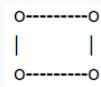
Both S1 and S2 are not True

Correct Option

**Solution:** (c)**Explanation:**

S1: False

Here is a 2-Regular Graph:



And it is not a complete graph.

S2 : False

Hamiltonian cycle visit every vertex in the graph exactly once. As a result, neither edges nor vertices can be repeated. Also, you may not use all the edges of the graph. Simply put, edge is formed of vertex pair. To repeat an edge, you have to revisit a vertex, which is not allowed.



None of the above

**Q.53)**

Subject: Engineering-Mathematics

Max Marks: 2



$$\lim_{x \rightarrow 0} \frac{e^x - 3^x - 2^x + 1}{x^2}$$

 $\log_e 2 * \log_e 3$ 

Correct Option

**Solution:** (A)

Solution:

$$\lim_{x \rightarrow 0} \frac{e^x - 3^x - 2^x + 1}{x^2}$$
 this is in  $\frac{0}{0}$  form applying L'Hopital's rule.

$$\Rightarrow \lim_{x \rightarrow 0} \frac{\frac{d}{dx}(e^x - 3^x - 2^x + 1)}{2x}$$
 this is in  $\frac{0}{0}$  form again applying L'Hopital's rule again.

$$\Rightarrow \lim_{x \rightarrow 0} \frac{\frac{d}{dx}(e^x - 3^x - 2^x + 1)}{2}$$

$$\Rightarrow \frac{(e^0)^2 - (3^0)^2 - (2^0)^2}{2}$$

$$\Rightarrow \frac{(1)^2 - (1)^2 - (1)^2}{2}$$

$$\Rightarrow \frac{(1)(1) - (1)(1) - (1)(1)}{2}$$

$$\Rightarrow \ln(2) * \ln(3)$$

$$\Rightarrow \log_e 2 * \log_e 3$$

B

$\log_{\epsilon} 5$

C

$\log_{\epsilon} 6$

D

0

Q.54)

Consider there are five processes arriving in a system that implements Multi-Level Feedback Queue (MLFQ) scheduler at 4, 7, 24, 26, 28 respectively. Their burst times are 14, 2, 5, 2, 2 respectively. There are 3 ready queue : queue 1 and queue 2 implement Round Robin Scheduling with time quanta of 2 and 5. And the third queue implements FCFS.

Which process has the highest completion time?

Note : C.S time is 1 unit.

A

P2

B

P3

Correct Option

Solution: (B)

**Explanation:**

	AT	BT
P1	4	14 12 7
P2	7	2 0
P3	24	5 3
P4	26	2 0
P5	28	2 0

Ready Queue 1 implements Round Robin (Time Quantum = 2)

Ready Queue 3 implements Round Robin (Time Quantum = 5)

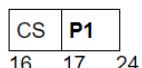
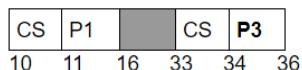
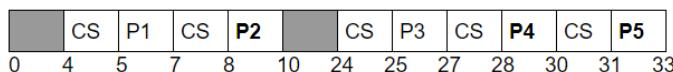
Process P1 completes at 24 from queue 3

Process P2 completes at 10 from queue 1

**Process P3 completes at 36 from queue 2**

Process P4 completes at 30 from queue 1

Process P5 completes at 33 from queue 1



P2 completes at 10 from queue 1

P3 completes at 36 from queue 2

P4 completes at 30 from queue 1

P5 completes at 33 from queue 1

C

P4

D

P5

Q.55)

Consider the following statement with respect to a connected undirected graph G.

Statement I: If G has all unique edges then it always has a unique minimum spanning tree.

Statement II: If G has a unique minimal spanning tree then all its edges are unique. Converse of Statement I

A

Both Statement I and Statement II are true.

B

Only Statement I is true.

Subject: Algorithms

Max Marks: 2

Correct Option

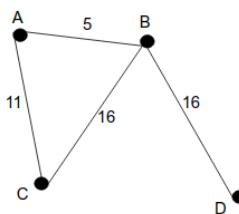
**Solution:** (B)

**Solution:**

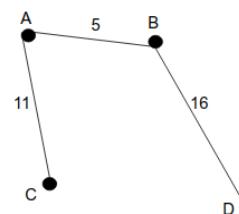
If G is a connected undirected graph with unique edge weights then the MST for such a graph is always unique, however, the converse of this statement is that if MST for a connected undirected graph is unique then the graph has all unique edge weight.

The statement I is true because there is only one way we can select the edges while constructing the MST using Kruskal's algorithm at each step, therefore the MST has to be unique.

Statement II is not true because we can easily construct examples where we have duplicate edge weights but the MST for that graph is unique for example see below graph.



Here we have 2 edges with weight 16 but we have only one unique MST which is



C Only Statement II is true.

D Neither I nor II is not true.

**Q.1)**

Ramesh while finding the mean of 30 two digit positive integers mistakenly exchanged the digits of one number, i.e., qp for pa. Due to which the mean was decreased by 2.7. Find the difference between p and q.

**Subject: General Aptitude**

**Max Marks: 1**

A 8

B 9

**Correct Option**

**Solution:** (B)

**Solution:** Let the number before mistake be pq  $\Rightarrow 10p + q$

Then after interchange of digits the number is qp  $\Rightarrow 10q + p$

The average decrease by 2.7, so we can say that the sum of the correct numbers has been decreased by  $(2.7 * 30) = 81$

So now we can say that,

$$(10p + q) = (10q + p) + 81$$

$$\Rightarrow 10p - p + q - 10q = 81$$

$$\Rightarrow 9p - 9q = 81$$

$$\Rightarrow p - q = \frac{81}{9} = 9$$

C 6

D 4

**Q.2)**

Select the most appropriate alternative to the underlined sentence below.

**Subject: General Aptitude**

**Max Marks: 1**

Mohit has done a great job of taking the company to its present status, but it is time that he let go of the reins.

Note:

Marks assigned to all (underline is missing in the answer)

A let go of the reins

**Correct Option**

**Solution:** (A)

**Solution:**

The given statement means that Mohit, who did a nice job of making the company what it is now, should now go away or leave it. 'Let go' refers to stop holding onto something, and in this context, it means to stop holding onto this job in the company or the responsibilities. Reins as a noun could refer to anything which is a means of control. So, the given statement is correct: option (a) is the answer. Option (b) is not more appropriate than (a) because 'stepping down' can also mean reducing the level/scope, so then it would mean that Mohit should not leave the company completely, which is different from what is stated in the statement. Option (c) is wrong because the word 'off' is different from 'of'. Option (d) is wrong because delegating responsibility means giving the responsibility to someone else, but that would slightly change the statement, as it does not say that Mohit should leave and give his responsibility to someone; this would be like adding information from our side, which is not allowed.

**B** stepped down

**C** let go off the reins

**D** delegated responsibility

**Q.3)**

Select the appropriate antonym of the given word

**METICULOUS**

Subject: General Aptitude

Max Marks: 1

**A** Inappropriate

**B** Sloppy

Correct Option

Solution: (B)

Solution:

Meaning of Meticulous is showing great attention to detail; very careful and precise. The meaning of Sloppy is careless and unsystematic; excessively casual.

**C** Robust

**D** Gullible

**Q.4)**

Find the correct alternative having the same meaning for the sentence given below

You need to clean your shoes properly.

Subject: General Aptitude

Max Marks: 1

**A** Your shoes are needed to clean properly.

**B** You are needed to clean your shoes properly.

**C** Your shoes need to be cleaned properly.

Correct Option

Solution: (C)

Solution:

The given sentence is in the form of passive voice and the answer to it is in the form of active voice and both of them have the same meaning and correct grammar. To convert the given passive voice to active voice the structure of "to be + verb" is used.

**D** Your shoes are needed by you to clean properly.

**Q.5)**

The breadth of rectangle has been decreased by 15% and at the same time the length of the same has been increased by 30%. What is the change in the percentage of the area of rectangle?

Subject: General Aptitude

Max Marks: 1

**A** 8.5%

**B** 10%

**C** 10.5%

Correct Option

Solution: (C)

**Solution:** Area of Rectangle = Length ( $l$ )  $\times$  Breadth ( $b$ )

$$\text{New Length} = l + (30\% \text{ of } l)$$

$$= l + 0.3 l$$

$$= 1.3 l$$

$$\text{New Breadth} = b - (15\% \text{ of } b)$$

$$= b - 0.15 b$$

$$= 0.85 b$$

$$\text{Therefore, New Area} = 1.3 l * 0.85 b$$

$$= 1.105 lb$$

$$\text{Change in the Area} = 1.105 lb - lb$$

$$= 0.105 lb$$

Hence we can say that there is a 10.5% increase in the area.

**D** 9.2%

**Q.6)**

Find the missing number in the following sequence

15, 22, 33, 60, 151, ?

Subject: General Aptitude

Max Marks: 2

416

462

498

Correct Option

**Solution:** (C)**Solution:**

We need to calculate the difference between the numbers given

 $22-15=7, 33-22=11, 60-33=27, 151-60=91$ 

Now if we take the difference of the difference, then we get,

 $11-7=4, 27-11=16, 91-27=64$ 

So now we can see a pattern of multiplication of 4

Hence to get the missing number we will multiply 4 with 64 to get 256.

Then we will add 256 to 91 to get the difference between the missing number and 151, i.e., 347

Therefore the missing number is  $151+347=498$ 

449

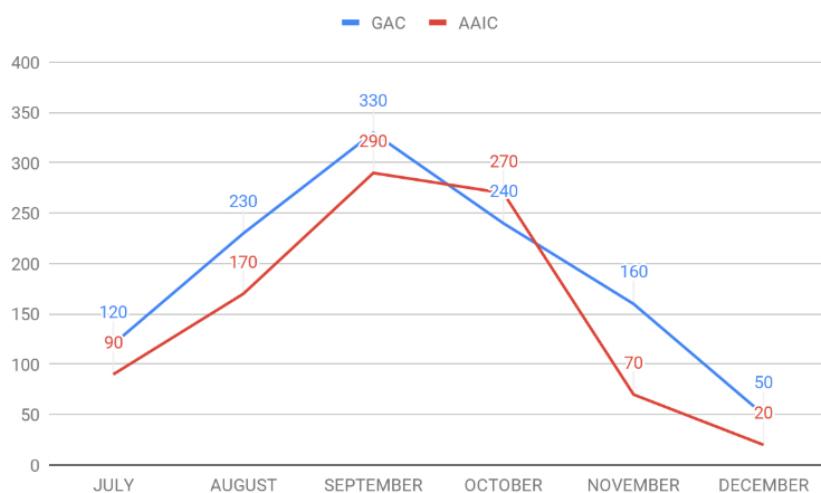
**Q.7)**

Subject: General Aptitude

Max Marks: 2



Below in the line graph showing the number of registrations for test series in last 6 months at GAC and AAIC. Find out in which of the two months the difference in percentage of registrations are the most?

**A** October, November**B** September, October**C** July, August**D** November, December

Correct Option

**Solution:** (D)**Solution:** Difference in July (%)  $\frac{120-90}{90} * 100 = 33.33\%$ Difference in August (%)  $\frac{230-170}{170} * 100 = 35.29\%$ Difference in September (%)  $\frac{330-290}{290} * 100 = 13.79\%$ Difference in October (%)  $\frac{240-270}{270} * 100 = -11.11\%$ Difference in November (%)  $\frac{160-70}{70} * 100 = 128.57\%$ Difference in December (%)  $\frac{50-20}{20} * 100 = 150\%$ 

Hence in November and December the difference in % of registrations is the most.

**Q.8)**

Subject: General Aptitude

Max Marks: 2



Which of the following given numbers has the maximum number of divisors?

9801, 10201, 15488, 16562

**A** 9801**B** 10201**C** 15488

Correct Option

**Solution:** (c)

**Solution:** The number of divisors can be found in the following manner:

The numbers should be written as the product of powers of prime numbers.

In general, if some number can be written in the form of  $2^a * 3^b * 5^c * \dots$ , then the number of divisors will be  $(a+1) * (b+1) * (c+1) * \dots$ .

So here we are given four numbers and for each number we need to calculate the number of divisors.

$$9801 = 3 * 3 * 3 * 3 * 11 * 11 = 3^4 * 11^2$$

$$\text{Number of divisors} = (4+1) * (2+1) = 5 * 3 = 15$$

$$10201 = 101 * 101 = 101^2$$

$$\text{Number of divisors} = (2+1) = 3$$

$$15488 = 2 * 2 * 2 * 2 * 2 * 2 * 11 * 11 = 2^7 * 11^2$$

$$\text{Number of divisors} = (7+1) * (2+1) = 8 * 3 = 24$$

$$16562 = 2 * 7 * 7 * 13 * 13 = 2^1 * 7^2 * 13^2$$

$$\text{Number of divisors} = (1+1) * (2+1) * (2+1) = 2 * 3 * 3 = 18$$

D

16562

Q.9)

MRP of rice has been quoted 40% above the cost of manufacturing. Yogesh the retailer of the rice shop sells rice at a profit of 18% and also given a discount of 5% on the MRP. What is the gain (in percentage) for Ramu who is the manufacturer on selling rice to Yogesh?

Subject: General Aptitude

Max Marks: 2

A

12.71%

Correct Option

**Solution:** (A)

**Solution:** Let the manufacturing cost be ₹ 100.

Then the MRP =  $100 + (100 * \frac{40}{100}) = 100 + 40 = ₹ 140$ .

Sale Price at which Yogesh sells rice after allowing 5% discount on

MRP =  $140 - (140 * \frac{5}{100}) = 140 - 7 = ₹ 133$

Let the price at which Yogesh purchases rice be ₹ x.

Yogesh sells rice at 18% profit and hence the sale price

$$= x + (x * \frac{18}{100}) = x + 0.18x = ₹ 1.18x$$

Therefore,  $1.18x = 133$

$$\Rightarrow x = ₹ 112.71$$

Purchase price of Yogesh = Sale price of Ramu

Hence, the profit of Ramu =  $112.71 - 100 = ₹ 12.71$

Therefore, Gain (in percentage) =  $\frac{12.71}{100} * 100 = 12.71\%$

B

13.52%

C

33%

D

12%

Q.10)

This simplified (\_\_\_\_\_ ) to the decision-making process is a must read for anyone (\_\_\_\_\_ ) important real estate, personal, or professional decisions.

Subject: General Aptitude

Max Marks: 2

A

primer, maximizing

Correct Option

B

tract, enacting

**Solution:** (B)

**Solution:**

The statement refers to something which simplified the process of making a decision, and this is important for someone who is dealing with real estate, personal or professional decisions. Option (b) is correct because tract means a brief treatise on a subject of interest; the word enacting would be right because it means making something happen, which in this case would mean making decisions. Option (a) is incorrect because primer just means an introductory book. It cannot reveal an entire simplified approach to make a decision. Also, 'maximizing decisions' does not make sense. Option (c) is wrong because just an introduction cannot explain the entire decision making progress. Also, 'under' is wrong for the second blank, because 'under decisions' is inappropriate. Option (d) is wrong, because 'facing' refers to encountering or dealing, and one does not face decisions.

C

introduction, under

D

guide, facing

close

