



Ashima Garg

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## FULL SYLLABUS TEST-6 (ADVANCE LEVEL) GATE 2018 - REPORTS

OVERALL ANALYSIS

COMPARISON REPORT

**SOLUTION REPORT**

ALL(65)

CORRECT(31)

INCORRECT(24)

SKIPPED(10)

**Q. 1**

In the question below, four words are given, two of which may or may not share a synonymous or antonymous relationship. From the given option choose the one that provides the correct pair of synonyms or antonyms.

- A. Infraction
- B. Crevice
- C. Wound
- D. Fissure

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A

BC

B

BD

Correct Option

**Solution :**

(b)

Infraction : Violation of a law or code. Crevice/fissure : A narrow gap or crack. Wound : An injury. (b) is the right answer as B and D are synonyms.

C

AD

D

AB

**QUESTION ANALYTICS****Q. 2**

You are provided with two sentences, in each of them two words are missing. You are given four options suggesting pair of words that together can make each of the sentences coherent and complete. Identify the correct pair (words can be used in any order).

1. An extraordinary satellite image shows the \_\_\_\_\_ scale of a heatwave that has left Brazil sweltering and is \_\_\_\_\_ some of the country's worst ever bushfires.
2. The Militant forces in Afghanistan appear to be deliberately barring the entry of civilian goods which can have \_\_\_\_\_ consequences for residents of the city, \_\_\_\_\_ a humanitarian crisis.

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A

massive, channeling

B

devastating, fueling

Your answer is Correct

**Solution :**

(b)

'Forbearing' means patient and restrained, which does not fit into the context here. 'Channeling' means to direct or to convey, which is incorrect to use for heatwave (heatwave is directing bushfires is not the correct way), similarly 'initiate' would be incorrect as it is in the simple present tense, and we need to be in its continuous form (initiating). Option (b) is the correct choice, 'fueling' means intensifying.

C



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catastrophic, initiate

QUESTION ANALYTICS

**Q. 3**

A part has been omitted from the sentence given below and it is to be filled with idiom(s), to make the sentence grammatically and meaningfully correct. Mark the answer accordingly. I understand your overwhelming desire to own this house, but it'll surely cost you \_\_\_\_\_.

1. Big bucks
2. An arm and a leg
3. A dime a dozen

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A

Both 1 and 2

Your answer is Correct

**Solution :**

(a)  
 'Big bucks' = lot of money. "An arm and a leg" = extremely expensive. "A dime a dozen" = inexpensive item. The construction of the sentence points towards an idiom which can supply the 'expensive' meaning. Both (1) and (2) can do that, making option (a) the correct answer.

B

Both 2 and 3

C

Only 1

D

Both 1 and 3

QUESTION ANALYTICS

**Q. 4**

What would come in place of the question mark in the given number series?  
 64, 96, 240, 840, 3780, ?

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A

12680

B

10840

C

20790

Your answer is Correct

**Solution :**

(c)

$$64 \times \frac{3}{2} = 96$$

$$96 \times \frac{5}{2} = 240$$

$$240 \times \frac{7}{2} = 840$$

$$840 \times \frac{9}{2} = 3780$$

$$3780 \times \frac{11}{2} = 20790$$



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## QUESTION ANALYTICS

**Q. 5**

In Kairana Lok Sabha by polls fought between two candidates, 10% of the voters didn't vote 20 votes were invalid. It is known that the winning candidate got 320 votes more than the other candidate and the number of votes received by winning candidate is 48% of the total eligible voters.

The total number of eligible voters is \_\_\_\_\_.

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5000

Correct Option

**Solution :**

5000

Let number of eligible voters be  $x$

$$\text{Total number of votes} = x - 10\% \text{ of } x = 0.9x$$

$$\text{Total number of valid votes} = 0.9x - 20$$

$$\text{Total votes received by winner} = 0.48x$$

$$\text{Votes received by other} = 0.9x - 20 - 0.48x = 0.42x - 20$$

$$\text{Hence, } 0.48x - 0.42x + 20 = 320$$

$$x = 5000$$

Your Answer is 334

## QUESTION ANALYTICS

**Q. 6**

A group of 10 men and 12 women were going to New York to attend a United Nations conference. A week before their departure, equal number of men and women joined them and the ratio of the total number of men and women became 6 : 7. Also, just one day before their departure, equal number of men and women left them. The new ratio between the number of men and women was 4 : 5. The final strength of the group that went for the conference is

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A

5 men and 6 women

B

6 men and 8 women

C

8 men and 10 women

Your answer is Correct

**Solution :**

(c)

Let  $x$  be the number of men who joined the group

$$\text{Thus, } \frac{(10+x)}{(12+x)} = \frac{6}{7}$$

$$\text{So, } x = 2$$

Now, the number of men and women become 12 and 14 respectively.

$$\text{So, } y = 4$$

Now, the number of men and women become 8 and 10 respectively.

D

10 men and 12 women



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**Q. 7**

Team Avengers can be formed by 20 boys and 10 girls of a school while team Guardians can be formed by 30 boys and 20 girls of the same school. If there are total of 1300 boys in the school and 800 girls in the school and from them ' $m$ ' number of team Avengers are formed and total ' $n$ ' number of team Guardians are formed, then find that ' $m$ ' is what percent of ' $n$ '?

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A

33.33%

B

44.44%

C

55.55%

D

66.67%

Correct Option

**Solution :**

(d)

Since ' $m$ ' number of team Avengers are formed. So, in team Avengers; total boys = 20  $m$  and total girls = 10  $m$ .

And ' $n$ ' number of team Guardians are formed. So, in team Guardians; total boys = 30  $n$  and total girls = 20  $n$ .

$$\text{Total boys} = 20m + 30n = 1300$$

$$\text{Total girls} = 10m + 20n = 800$$

From equation (i) and (ii), we get

$$2 \times (10m + 20n) - (20m + 30n) = 2 \times 800 - 1300$$

$$\Rightarrow 40n - 30n = 300$$

$$\Rightarrow n = 30 \text{ and } m = 20$$

$$\text{Required percent} = \left( \frac{m}{n} \right) \times 100 = \left( \frac{20}{30} \right) \times 100 = 66.67\%$$

QUESTION ANALYTICS

**Q. 8**

There are two groups of persons Alpha and Beta, and each group has 5 persons. The average age of persons of group Alpha is 22 years while the average age of persons of group Beta is 19 years. Alpha person Max from group Alpha joins group Beta and then average age of group Alpha becomes 24 years. Then, Ross, a person from group Alpha joins group Beta and the average age of group Beta becomes 20 years. Now, a person John of group Beta joins group Alpha and the average age of group Alpha becomes 22 years then the ratio of age of John to the age of Max would be

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A

7 : 16

B

14 : 23

C

16 : 7

D

23 : 14

Your answer is Correct

**Solution :**

(d)

 $\text{Sum of total age of 5 persons of group Alpha} = 22 \times 5 = 110 \text{ years}$



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 Resultant total age of persons of group Alpha =  $24 \times 4 = 96$  years

 Age of Max =  $110 - 96 = 14$  years

## Case 2:

Ross joins group Beta from group Alpha

 Sum of age of persons of group Beta =  $20 \times 7 = 140$ 

 Age of Ross =  $140 - (95 + 40) = 31$  years

 Sum of age of persons of group Alpha =  $96 - 31 = 65$  years

## Case 3:

 Sum of total age of persons of group Alpha =  $22 \times 4 = 88$  years

 Age of John =  $88 - 65 = 23$  years

Required ratio = 23 : 14

QUESTION ANALYTICS

**Q. 9**

Sonam can travel at a speed of 60 km/hr. Ameesha can travel at a speed of 36 km/hr. Ankita can go from Agra to Kanpur in 2 hours. The distance between Agra and Kanpur is equal to the distance between Agra and Delhi. Ameesha takes the same time travelling from Agra to Kanpur as from Kanpur to Delhi at her speed which is twice the speed of Ankita. How much time will Sonam take to cover a distance from Agra to Delhi and back to Agra (consider that the route followed to reach Kanpur from Agra and Delhi from Agra is different but the length of the route is the same?)

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A

42 minutes

B

60 minutes

C

72 minutes

**Your answer is Correct**
**Solution :**

(c)

Speed of Sonam = 60 km/hr

Speed of Ameesha = 36 km/hr

Speed of Ankita = 18 km/hr (since Ameesha's speed is twice of Ankita)

Time taken to cover Agra to Kanpur by Ankita = 2 hours (since time is inversely proportional to distance)  
 Hence, distance between Agra and Kanpur =  $2 \times 18 = 36$  km (since Ankita takes 2 hours to cover the distance and her speed is 18 km/hr).

So, the distance between Agra and Delhi = 36 km

Sonam has to cover  $36 \times 2 = 72$  km

$$\text{Time taken by Sonam} = \frac{72}{60} \times 60 = 72 \text{ minutes}$$

D

84 minutes

QUESTION ANALYTICS

**Q. 10**

Chandan and Falguni work on alternate days; Chandan working on the 1<sup>st</sup> day, Falguni on the 2<sup>nd</sup>, then Chandan again on the 3<sup>rd</sup> followed by Falguni on the 4<sup>th</sup> and so on. In this way, they can finish the work in 25 days. The work done by Chandan varies every day and on any particular day  $d$ , the work done by Chandan is  $d$  units. Falguni works at a constant rate. The ratio of the work done by Chandan on the 1<sup>st</sup> day to that done by Falguni on the 2<sup>nd</sup> day is 1 : 4. The time Falguni alone will require to finish the work is \_\_\_\_\_ days.

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## SOLUTION :

54.25 (54 to 54.50)

Work done by Chandan on 1<sup>st</sup> day = 1 unitWork done on 3<sup>rd</sup> day = 3 units, on 5<sup>th</sup> day = 5 units and so on. Since ratio of work done by Chandan on 1<sup>st</sup> day to Falguni on 2<sup>nd</sup> day is 1 : 4, therefore work done by Falguni on 2<sup>nd</sup> day and subsequent days) =  $4 \times 1 = 4$  unitsNow Chandan works on 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, ..., 25<sup>th</sup> days, i.e. on all the odd numbered days till 25.So total work done by Chandan =  $(1 + 3 + 5 + 7 + \dots + 25)$  units = 169 unitsNow Falguni works on 2<sup>nd</sup>, 4<sup>th</sup>, 6<sup>th</sup>, ..., 24<sup>th</sup> days, i.e. all the even numbered days till 25.

So number of days worked by Falguni = 12

Work done by Falguni in one day = 4 units

So the total work done by Falguni =  $12 \times 4 = 48$  units

$$\begin{aligned} \text{So total work done} &= \text{Work done by Chandan} + \text{Work done by Falguni} \\ &= 169 + 48 = 217 \text{ units} \end{aligned}$$

$$\text{Now time taken by Falguni alone to finish the work} = \frac{217}{4} = 54.25 \text{ days}$$

Your Answer is 55

QUESTION ANALYTICS

## Q. 11

Let  $w$  be a binary string over  $\{0, 1\}^*$  and  $d(w)$  denote its decimal value. The number of states in the minimal DFA corresponding to the set of all binary strings  $w$ , such that  $w$  ends with 1 and  $d(w)$  is even, is

Have any Doubt ?

A

3

B

4

C

6

D

1

Your answer is Correct

## Solution :

(d)

If a number is even, it will always end with a 0. So there is no such string  $w$  which is both even, as well as ends with a 1. Always remember, LSB = 0 implies number is even, else odd. Hence language generated in this case will be empty.

Therefore for empty language, the number of states required = 1.

QUESTION ANALYTICS

## Q. 12

Consider the following regular expressions over  $\{0, 1\}$  respectively.I.  $101(0+1)^*101$ II.  $101(0+1)^*101 + (10)^2 1$ III.  $101(0+1)^*$ 

Which of the above regular expression(s) correctly generate the set of all binary strings starting and ending with 101?

Have any Doubt ?

A

I only



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C

III only

D

None of these

Your answer is Correct

**Solution :**

(d)

None of these regular expressions generate the required language. For example, the regular expressions I and II do not generate the string 101, which also starts and ends with 101. However the third regular expression actually generates a superset of the required language and thus some non members which do not end with 101 are also generated. Hence option D is the most appropriate choice. And it's good to know that the correct regular expression for the specification given will be  $101(0+1)^*101 + 101 + 10101$

QUESTION ANALYTICS

**Q. 13**

Consider the following statements given below:

 $S_1$  : FCFS scheduling may suffer from starvation. $S_2$  : User process can not modify its own page table entries. $S_3$  : A fork system call will fail if the previously executed statement is also a fork call.

Which of the above statements are correct?

Have any Doubt ?

A

 $S_1$  and  $S_3$  only

B

 $S_1$  and  $S_2$  only

C

Only  $S_2$ 

Correct Option

**Solution :**

(c)

 $S_1$  : FCFS will never suffer from starvation. $S_2$  : User process can not modify its own page table entries if it is allowed then it can access other processes physical memory. $S_3$  : There is no effect on fork system call if the previously executed statement is a fork call.So only  $S_2$  is true.

D

Only  $S_1$ 

Your answer is Wrong

QUESTION ANALYTICS

**Q. 14**

Match List-I with List-II and select the correct answer using the codes given below the lists:

**List-I**

- A. Prediction buffer
- B. Register renaming
- C. Hierarchical memory

**List-II**

- 1. Inclusion
- 2. Control dependency
- 3. Output data dependency

Which of the following is correct?

Codes:

A B C

(a) 1 2 3



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A

a

B

b

Your answer is Wrong

C

c

D

d

Correct Option

**Solution :**

(d)

- Prediction buffer - used for control dependency
- Register renaming - used for data dependency
- Hierachial memory - locality of reference inclusion

QUESTION ANALYTICS

**Q. 15**

Consider the following statements regarding simple undirected graphs.

- If a graph G with  $n$  vertices has  $n - 1$  edges, then G is a tree.
  - If a graph G with  $n$  vertices is acyclic, then G is a tree.
- Which of the above statements are correct?

Have any Doubt ?

A

Both I and II

B

Only I

C

Only II

Your answer is Wrong

D

None of these

Correct Option

**Solution :**

(d)

Both are false.

I is false. Here's a graph which has 4 vertices and 3 edges, and yet it is not a tree because it is disconnected.



II is false because even though G is acyclic, G may be disconnected. So II is also false.

QUESTION ANALYTICS

**Q. 16**



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Which of the above statements is/are true?

[Have any Doubt ?](#)

A

Only  $S_1$ 
[Correct Option](#)
**Solution :**

(a)

$S_1$ : If LALR(1) parser have shift reduce conflict then CLR(1) parser must have shift reduce conflict.  $S_1$  is true

$S_2$ : Compiler uses symbol table to store all the record not stack.  $S_2$  is false

B

Only  $S_2$ 

C

Both  $S_1$  and  $S_2$ 
[Your answer is Wrong](#)

D

None of the above

QUESTION ANALYTICS

**Q. 17**

Consider the following statements regarding binary trees.

- I. It is possible to construct a binary search tree uniquely from pre-order and post-order traversal sequence.
  - II. If the number of leaves in a tree is not a power of 2, then such a tree is not a binary tree.
- Which of the following is the most appropriate choice regarding I and II?

[Have any Doubt ?](#)

A

Both I and II are true

B

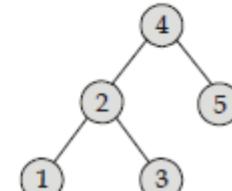
I is true, II is false

[Correct Option](#)
**Solution :**

(b)

Since we are given a BST, we can get the inorder by sorting either preorder or postorder. Then use inorder and preorder/postorder to construct a unique BST. So I is true.

However II can be easily falsified. For example, the tree given below has 3 leaves, which is not a power of 2 and still qualifies to be a binary tree, as the condition for a tree to be binary tree is that it must possess at most 2 children and so II is false.



Therefore the correct choice is option (b).

C

I is false, II is true

D

Both I and II are false

[Your answer is Wrong](#)



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## Q. 18

A 4-bit ripple counter uses J-K flip-flops. If the propagation delay of each flip-flop is 40 nsec. Then what is the maximum clock frequency?

Have any Doubt?

A

6.25 MHz

Your answer is Correct

**Solution :**

(a)

$$t_{pd} \geq 4 \times 40 \text{ nsec}$$

$$t_{pd} \geq 160 \text{ nsec}$$

$$t_{\min} = 160 \text{ nsec}$$

$$f_{\max} = \frac{1}{160 \times 10^{-9}} \text{ Hz} = \frac{10^9}{160} \text{ Hz} = \frac{10^3}{160} \text{ MHz} \\ = 6.25 \text{ MHz}$$

B

16.66 MHz

C

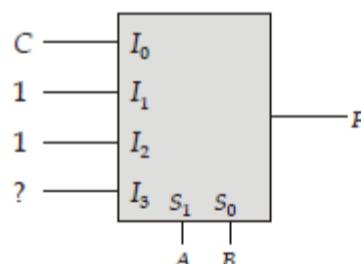
5.5 MHz

D

6.67 MHz

QUESTION ANALYTICS

## Q. 19

For the  $4 \times 1$  MUX shown below:If the output  $F = A + B + C$ , then  $I_3$  will be

Have any Doubt?

A

A

Your answer is Correct

**Solution :**

(a)

$$\begin{aligned} F &= \bar{S}_1 \bar{S}_0 I_0 + \bar{S}_1 S_0 I_1 + S_1 \bar{S}_0 I_2 + S_1 S_0 I_3 \\ &= \bar{A}\bar{B}C + \bar{A}B \cdot 1 + A\bar{B}1 + AB1 \\ &= \bar{A}\bar{B}C + \bar{A}B + A\bar{B} + AB1 \\ &= B(\bar{A} + AI_3) + \bar{B}(\bar{A}C + A) \\ &= B(\bar{A} + I_3) + \bar{B}(A + C) \end{aligned} \quad \dots(i)$$

Let  $I_3 = A$ ,

$$\begin{aligned} F &= B(A + \bar{A}) + \bar{B}(A + C) = B + \bar{B}(A + C) \\ &= (B + \bar{B})(A + B + C) \\ &= A + B + C \end{aligned}$$

Let  $I_3 = C$ ,

∴

$$\begin{aligned} F &= B(\bar{A} + C) + \bar{B}(A + C) \\ &= \bar{A}B + BC + A\bar{B} + C\bar{B} \end{aligned}$$



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B

0

C

C

D

All of the above

QUESTION ANALYTICS

**Q. 20**

Consider the following relations given below:

Employee (eid, ename, salary)

Project (Pno, eid)

Which of the following is correct implementation of "Find eids of Employee who make the highest salary"?

[Have any Doubt ?](#)

A

```
SELECT E.eid FROM Employee E WHERE
  E.salary = (Select MAX (E2.salary)
    FROM Employee E2)
```

Your answer is Wrong

B

$$\{E_1.eid \mid E_1 \in Employees \wedge \neg (\exists E_2 \in Employee \\ (E_2.salary > E_1.salary))\}$$

C

Both (a) and (b)

Correct Option

**Solution :**

(c)

In SQL query sub query return the highest salary and outer query gives the eids of Employee who make the highest salary. Tuple relational query gives the same result as SQL query. Both query is the correct implementation. So option (c) is correct.

D

None of the above

QUESTION ANALYTICS

**Q. 21**

Consider the following C declaration.

int\* (\*p)(int, char);

Which of the following is the best description with respect to p?

[Have any Doubt ?](#)

A

*p* is a pointer to a function which takes an integer and character as arguments and returns an integer.

B

*p* is a function which takes an integer and character as arguments and returns an integer pointer.

C

*p* is a pointer to a function which takes a character as arguments and returns a character pointer.



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**Solution :**

(d)

"*p* is a pointer to a function which takes an integer and character as arguments and returns pointer to an integer". So (d) is correct.

Your answer is Correct

QUESTION ANALYTICS

**Q. 22**

Which of the following is true?

Have any Doubt ?

**A**

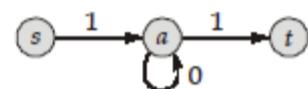
The running time of Radix Sort is effectively independent of whether the input is already sorted.

Correct Option

**Solution :**

(a)

- In Radix Sort, all input orderings give the worst-case running time, the running time does depend on the order of the inputs in any significant way.
- The parent pointers may not lead back to the source node if a zero length cycle exists. In the example below, relaxing the  $(s, a)$  edge will set  $d[a] = 1$  and  $\pi[a] = s$ . Then, relaxing  $(a, t)$  edge will set  $d[t] = 1$  and  $\pi[t] = a$ . Following the  $\pi$  pointers from  $t$  will no longer give a depth to  $s$ , so the algorithm is incor

**B**

Changing the RELAX function to update is  $d[v] \geq d[u] + w$  ( $u, v$ ) (instead of strictly greater than) may produce shortest path, but will not effect the correctness of Bellman-Ford algorithms outputs.

Your answer is Wrong

**C**

Both (a) and (b)

**D**

None of these

QUESTION ANALYTICS

**Q. 23**

A stack based CPU executes the instruction. Memory location 500 contain 0x88 and memory location 700 contains 0x37. The stack pointer is at 0x003F.

The instructions are as follows:

- $I_1$  : PUSH 500  
 $I_2$  : PUSH 700  
 $I_3$  : ADD  
 $I_4$  : POP 600  
 $I_5$  : PUSH 300

Which of the following is correct?

Have any Doubt ?

**A**

Stack pointer will be at 0x0040 after executing instructions

**B**

Memory location 0x40 contain 0x88 after executing instructions



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D

Both (a) and (c)

Correct Option

**Solution :**

(d)

Stack pointer → 0x0041	0xBF	[Memory location 300]	→ 0xBF stored at 600
	0x0040	0x37	→ [Memory location 700]
	0x003F	0x88	→ [Memory location 500]

QUESTION ANALYTICS

**Q. 24**

The system of equations:

$$2x + 3y + 5z = 9$$

$$8x + 3y - 2z = 8$$

$$2x + 3y + \lambda z = \mu$$

Has no solution for values of  $\lambda$  and  $\mu$  given by

Have any Doubt ?

A

$$\lambda = 5, \mu = 9$$

B

$$\lambda = 5, \mu \neq 9$$

Your answer is Correct

**Solution :**

(b)

The augmented matrix for the system of equation is

$$[A/B] = \left[ \begin{array}{ccc|c} 2 & 3 & 5 & 9 \\ 8 & 3 & -2 & 8 \\ 2 & 3 & \lambda & \mu \end{array} \right]$$

$$= \left[ \begin{array}{ccc|c} 2 & 3 & 5 & 9 \\ 0 & -9 & -22 & -28 \\ 0 & 0 & \lambda - 5 & \mu - 9 \end{array} \right] \quad [R_3 \rightarrow R_3 - R_1, R_2 \rightarrow R_2 - 4R_1]$$

If  $\lambda = 5$ and  $\mu \neq 9$ Then, Rank  $[A/B] = 3$  and rank  $[A] = 2$  $\therefore$  Rank  $[A/B] \neq$  Rank  $[A]$  $\therefore$  Given system of equation has no solution for,

$$\lambda = 5$$

and  $\mu \neq 9$ 

C

$$\lambda \neq 5, \mu = 9$$

D

$$\lambda \neq 5, \mu \neq 9$$

QUESTION ANALYTICS

**Q. 25**



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A

All the interface of the router must belong to same network.

Correct Option

**Solution :**

(a)

Option (a) is false and (b), (c) and (d) are true.

B

Routers are by default broadcast domain separator.

Your answer is Wrong

C

The ethernet interface and the LAN must belong to the same network.

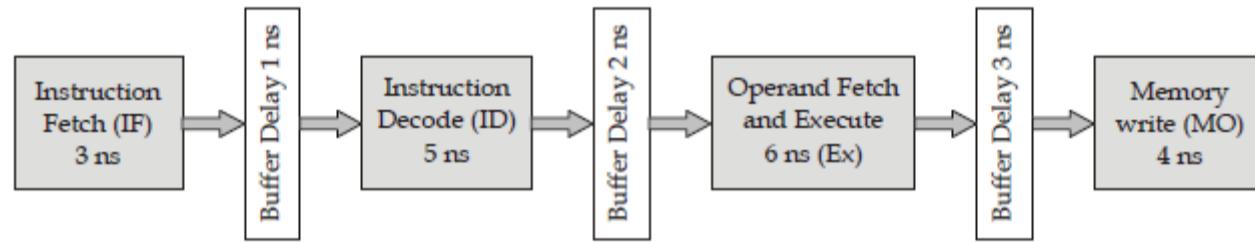
D

Router is not a multi protocol device.

QUESTION ANALYTICS

**Q. 26**

Consider an instruction pipeline as shown below:



A program having 100 instructions is executed in the pipelined processor. Instruction  $I_4$  is the unconditional jump instruction and branch address is known after EX stage. The time needed to complete the execution of the program if the branch target address is 98th instruction is \_\_\_\_\_ (in ns).

Have any Doubt ?

108

Correct Option

**Solution :**

108

Let's take 100 instruction is  $I_1, I_2, I_3, \dots, I_{98}, I_{99}, I_{100}$ 

Instruction	1	2	3	4	5	6	7	8	9	10	11	12
$I_1$	IF	ID	EX	MO								
$I_2$		IF	ID	EX	MO							
$I_3$			IF	ID	EX	MO						
$I_4$				IF	ID	EX	MO					
$I_5$					IF	ID	EX					
$I_6$						IF	ID					
$I_{98}$							IF	ID	EX	MO		
$I_{99}$								IF	ID	EX	MO	
$I_{100}$									IF	ID	EX	MO

$$n = 9$$

$$\begin{aligned} \text{Total time required} &= (K + n - 1) t_p \\ &= (4 + 9 - 1) 9 \text{ ns} \\ &= 108 \text{ ns} \end{aligned}$$

Your Answer is 99

QUESTION ANALYTICS



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$A \rightarrow A + B \quad \{A.val = A_1.val - B.val\}$   
 $A \rightarrow id \quad \{A.val = id.val\}$   
 $B \rightarrow B - C \quad \{B.val = B_1.val \times C.val\}$   
 $B \rightarrow id \quad \{B.val = id.val\}$   
 $C \rightarrow id \quad \{C.val = id.val\}$

What will be the output of the following expression?

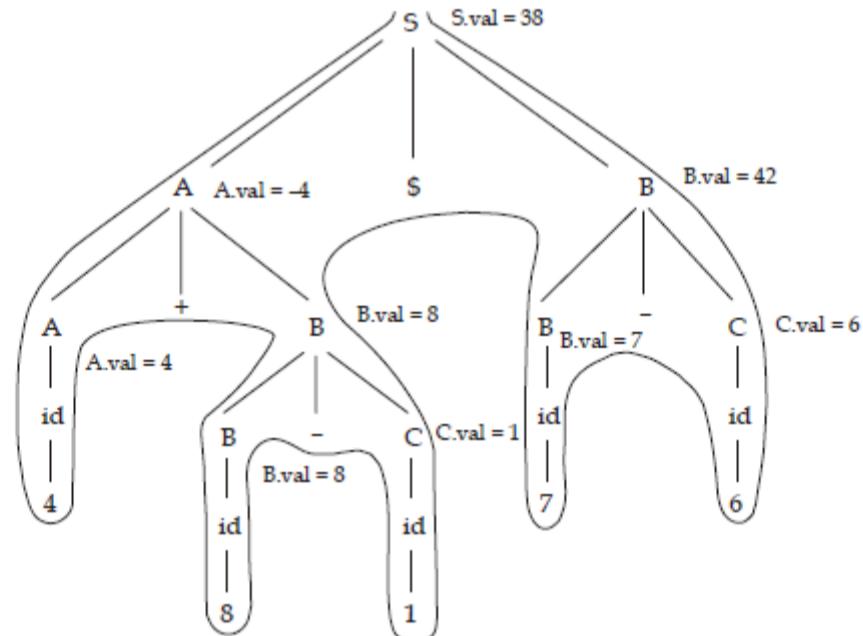
4 + 8 - 1 \$ 7 - 6

[Have any Doubt ?](#)

38

Your answer is **Correct** 38**Solution :**

38



Final value of the expression is 38.

[QUESTION ANALYTICS](#)**Q. 28**The number of ways in which we can place 3 white pawns and 3 black pawns on a  $3 \times 3$  Chessboard is equal to \_\_\_\_\_.[Have any Doubt ?](#)

1680

Correct Option

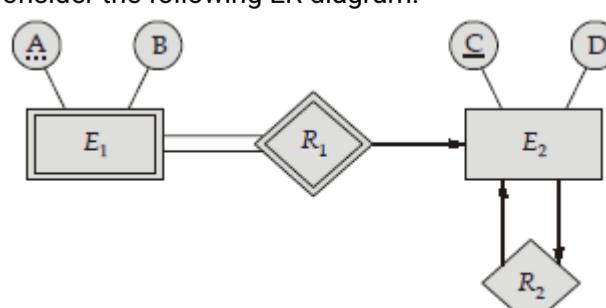
**Solution :**

1680

The required number of ways =  ${}^9C_6 * {}^6C_3 * {}^3C_3$   
 Solving this, we get 1680 as the answer.

[QUESTION ANALYTICS](#)**Q. 29**

Consider the following ER diagram:





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2

Your answer is Correct2

**Solution :**

2

- (i)  $E_1 R_1$  which has AC as a candidate key.
- (ii)  $E_2 R_2$  which has C as a candidate key.

Total 2 tables required.

QUESTION ANALYTICS

**Q. 30**

Consider the following C code:

```
#include <stdio.h>
int incr(int i)
{
    static int count = 1;
    count* = i;
    return count;
}
int main()
{
    int i, j;
    for(i = 1; i <= 7; i++) j = incr(i);
    printf("%d", j);
    return 0;
}
```

The output of the above program will be \_\_\_\_\_.

Have any Doubt ?

5040

Your answer is Correct5040

**Solution :**

5040

The program is actually returning the factorial of 7. Here's how the iterations will go on.

$$\begin{aligned} i &= 1, \quad j = 1 \\ i &= 2, \quad j = 2 \\ i &= 3, \quad j = 6 \\ i &= 4, \quad j = 24 \\ i &= 5, \quad j = 120 \\ i &= 6, \quad j = 720 \\ i &= 7, \quad j = 5040 \end{aligned}$$

So 5040 will be the answer.

QUESTION ANALYTICS

**Q. 31**

Let S be a binary semaphore variable and value of S = 0 what will be the value of S when following operations are executed on semaphore S \_\_\_\_\_.

2P, 4V, 5P, 2P, 8V, 3P, 2V

(Here P and V are usual semaphore operations)

Have any Doubt ?

0

Correct Option

**Solution :**

2

S is a binary semaphore so it can take value 0 or 1. Operations 2D, 4V, 5D, 2D, 8V, 3D, 2V final value is S -



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QUESTION ANALYTICS

Your Answer is 2

**Q. 32**

We are given a hash table H which has  $2^{20}$  elements and an unknown number of slots. If the load factor for H is equal to  $2^{10}$ ,  
 then the number of slots in H is equal to \_\_\_\_\_.

[FAQ](#) | [Have any Doubt ?](#) | 

1024

Correct Option

**Solution :**

1024

$$\text{Given, Load factor} = 2^{10} = \frac{\text{Total number of elements in H}}{\text{Number of slots in H}}$$

$$= \left( \frac{2^{20}}{x} \right) = 2^{10}$$

Solving for x, we get  $x = 2^{10}$ 

Therefore number of slots will be 1024.

Your Answer is 1073741824

QUESTION ANALYTICS

**Q. 33**

Consider the following statements given below:

 $S_1$  : In relational algebra join is a basic operation. $S_2$  : If a functional dependency  $A \rightarrow B$  holds in relation  $R(A, B, C)$  then  $AC \rightarrow B$  also holds. $S_3$  : In the WHERE clause of a SQL query, the condition ' $A$ ' = NULL is evaluated to be false.

How many number of above statements are true \_\_\_\_\_.

[Have any Doubt ?](#) | 

1

Your answer is Correct1

**Solution :**

1

$S_1$  : In relational algebra basic operations are  $(\sigma, \pi, U, -, \times, \rho)$ . Join is not a basic operation because it can be derived from basic operations.

$S_2$  :  $R(A, B, C)$ , if  $A \rightarrow B$  holds then  $AC \rightarrow B$  also holds.  $S_2$  is true

$S_3$  : NULL in any comparison can not be evaluate either TRUE or FALSE because NULL is not a value and we can not compare a value with a which is not a value.  $S_3$  is false

QUESTION ANALYTICS

**Q. 34**

Disk request come into disk driver for cylinders 5, 17, 60, 125, 28, 170, 8, 32. Total moves using SCAN algorithm when disk head is currently positioned at 35 and moving toward higher cylinder number \_\_\_\_\_. (Disk system has 200 cylinder 0 - 199)

[Have any Doubt ?](#) |



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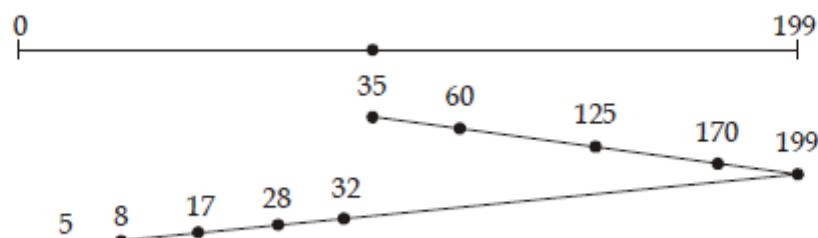
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Cylinder number - 5, 17, 60, 125, 28, 170, 8, 32

In SCAN algorithm disk head move till the last cylinder with servicing the requests then change the direction move till inner most cylinder with servicing requests.



$$\begin{aligned} \text{Total moves} &= (60 - 35) + (125 - 60) + (170 - 125) + (199 - 170) + (199 - 32) \\ &\quad + (32 - 28) + (28 - 17) + (17 - 8) + (8 - 5) \\ &= 25 + 65 + 45 + 29 + 167 + 4 + 11 + 9 + 3 = 358 \end{aligned}$$

QUESTION ANALYTICS

**Q. 35**

Consider the hashing table with ' $m$ ' slots and ' $n$ ' keys. If the expected number of probes in unsuccessful search is 3. The expected number of probes in a successful search is \_\_\_\_\_ (Upto 2 decimal place).

1.647 (1.64 - 2.00)

Correct Option

**Solution :**

1.647 (1.64 - 2.00)

Expected number of probes in "unsuccessful search"

$$= \frac{1}{1-\alpha}$$

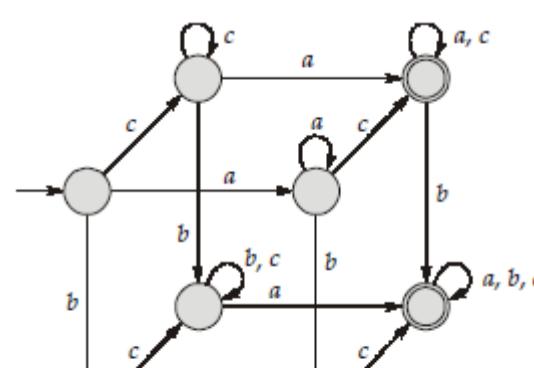
$$\text{Where } \alpha = \frac{n}{m} \text{ (load factor)}$$

$$\therefore \frac{m}{m-n} = 3 \Rightarrow 2m = 3n \quad \dots(i)$$

Now, expected number of probes in successful search is

$$\begin{aligned} &= \frac{1}{\alpha} \ln \left( \frac{1}{1-\alpha} \right) \\ &\Rightarrow = \frac{m}{n} \ln \left( \frac{1}{1-\alpha} \right) \\ &\Rightarrow = \frac{3}{2} \ln(3) \\ &\Rightarrow = 1.647 \quad \{ \text{by using } i \} \end{aligned}$$

QUESTION ANALYTICS

**Q. 36**Consider the following DFA over  $\{a, b, c\}$ .



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A

$$\{w \mid w \in (a, b, c)^*; n_a(w) \geq 1, n_b(w) \geq 1, n_c(w) \geq 1\}$$

B

$$\{w \mid w \in (a, b, c)^*; n_a(w) \leq 1, n_c(w) \geq 1, n_b(w) \geq 0\}$$

C

$$\{w \mid w \in (a, b, c)^*; n_a(w) \leq 1, n_b(w) \leq 1, n_c(w) \geq 1\}$$

D

$$\{w \mid w \in (a, b, c)^*; n_a(w) \geq 1, n_c(w) \geq 1, n_b(w) \geq 0\}$$

Your answer is Correct

Solution :

(d)

$$X = L(\geq 1a, \geq 1b, \geq 1c)$$

U

$$L(\geq 1a, = 0b, \geq 1c)$$

∴

$$X = L\left(\begin{array}{l} \geq 1a, \\ (= 0b) \\ \text{or} \\ \geq 1b \end{array}\right)$$

$$= L(\geq 1a, \geq 1c, \geq 0b) \quad [\text{any number of } b's]$$

Therefore (d) is the correct choice.

QUESTION ANALYTICS

**Q. 37**

Suppose that host A is connected to a router R1, R1 is connected to another router R2 and R2 is connected to host B. Suppose that a TCP message that contains 900 bytes of data and 20 bytes of TCP header is passed to the IP code at host A for delivery to B. Assume that link A-R1 can support a maximum frame size of 1024 bytes including a 14-byte frame header, link R1-R2 can support a maximum frame size of 512 bytes, including an 8-byte frame header, and link R2-B can support a maximum frame size of 512 bytes including a 12-byte frame header. Which of the following is correct about the Total length, DF, MF and Fragment offset fields of the IP header in the last packet transmitted over the link R1-R2?

Have any Doubt ?

A

Length = 500; DF = 0; MF = 0; Offset = 63

B

Length = 500; DF = 0; MF = 1; Offset = 60

C

Length = 424; DF = 0; MF = 0; Offset = 63

Correct Option

Solution :

(c)

The initial IP datagram will be fragmented as shown below. No other fragmentation will occur.

Link A-R1:

Length = 934 [920 + 14]; DF = 0; MF = 0; Offset = 0

Link R1-R2:

(1) Length = 512 [504 + 8]; DF = 0; MF = 1; Offset = 0

(2) Length = 424 [416 + 8]; DF = 0; MF = 0; Offset = 63

D

Length = 460; DF = 0; MF = 0; Offset = 60



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**Q. 38**

Consider the following C statements:

 $S_1 : \text{int } c = a + b;$   
 $S_2 : \text{for } (a, b, c);$   
 $S_3 : \text{Whil } (a, b);$ 

Which of the above statements will give syntax error?

[Have any Doubt ?](#)

A

Only  $S_2$  and  $S_3$ 

B

Only  $S_2$ 

Correct Option

**Solution :**

(b)

 $S_1 : \text{int } c = a + b;$  this is syntactically correct. $S_2 : \text{for } (a, b, c);$  this is not correct. The correct syntax of for loop is  $\text{for } (a; b; c).$  $S_3 : \text{whil } (a, b);$  this is correct because While ( $a, b$ ) can be a function having  $a$  and  $b$  as its parameters.

So option (b) is correct.

C

Only  $S_3$ 

Your answer is Wrong

D

None of the above

QUESTION ANALYTICS

**Q. 39**Which of the following is not a subgroup of  $(\mathbb{Z}, +)$ ? Note that the sets O and E denote the set of odd integers and even integers respectively.
[Have any Doubt ?](#)

A

 $(E, +)$ 

B

 $(O, +)$ 

Your answer is Correct

**Solution :**

(b)

O is not a subgroup of Z, as odd + odd = even, which does not belong to the set O.

Therefore it is not closed.

So (b) is the answer.

C

 $(\{3k \mid k \in \mathbb{Z}\}, +)$ 

D

 $(\{-4k \mid k \in \mathbb{Z}\}, +)$ 

QUESTION ANALYTICS

**Q. 40**



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```
SELECT sid FROM Enroll E, Course C
  WHERE E.cno = C.cno AND dep = 'CS'
EXCEPT (SELECT sid FROM
  Course C, Enroll E WHERE E.cno = C.cno AND dep = 'EC')
```

What does the above SQL query returns?

[Have any Doubt ?](#)

A

Finds the sid of students who are enrolled in some courses offered by CS department and not enrolled in some courses offered by EC department.

[Correct Option](#)**Solution :**

(a)

SQL query returned the sid of students who are enrolled in some courses offered by CS department and not enrolled in some courses offered by EC department.

B

Finds the sid of students who are enrolled in all courses offered by CS department and not enrolled in all courses offered by EC department.

[Your answer is Wrong](#)

C

Finds the sid of students who are enrolled in all courses offered by CS department and not enrolled in some courses offered by EC department.

D

Finds the sid of students who are enrolled in some courses offered by CS department and not enrolled in all courses offered by EC department.

[QUESTION ANALYTICS](#)**Q. 41**

The  $(r - 1)$ 's complement of a number can be found using formula  $(r^n - r^{-m} - N)$  where  $r$  is base of the number  $N$  having  $n$  digits and  $m$  digits in integral and fraction part respectively. We have been given some decimal numbers as shown below:

- (i) 325                   (ii) 325.893
- (iii) -819               (iv) -517.67

How many  $(r - 1)$ 's complement of above decimal numbers can be calculated using mentioned formula?

[Have any Doubt ?](#)

A

1

B

2

[Correct Option](#)**Solution :**

(b)

$(r^n - r^{-m} - N)$  is used to find  $(r - 1)$ 's complement of positive number.

Hence (i) and (ii)'s  $(r - 1)$ 's complement can be calculated.

C

3

D

4

[QUESTION ANALYTICS](#)**Q. 42**



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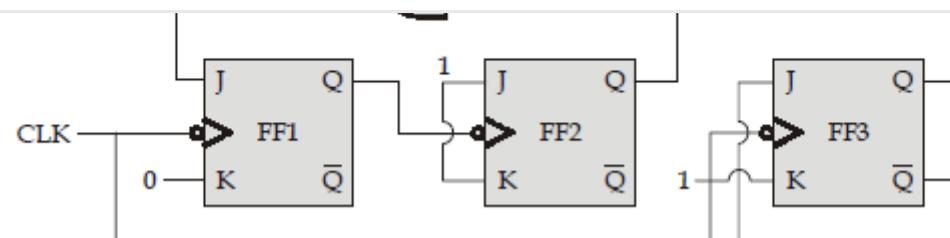
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Assume initially all flip-flops are in reset state. What will be the mod of above digital circuit?

Have any Doubt?

A

2

Your answer is Correct

**Solution :**

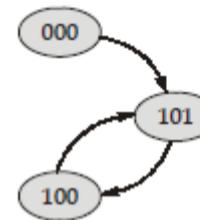
(a)

In the circuit we have

$$\begin{aligned} J_1 &= \overline{Q_2 Q_3}, & K_1 &= 0 \\ J_2 &= 1, & K_2 &= 1 \\ J_3 &= \overline{Q}_3, & K_3 &= 1 \end{aligned}$$

The truth table for the circuit is obtained below:

CLK	Input						Output
	FF1		FF2		FF3		
	J <sub>1</sub>	K <sub>1</sub>	J <sub>2</sub>	K <sub>2</sub>	J <sub>3</sub>	K <sub>3</sub>	Q <sub>1</sub> Q <sub>2</sub> Q <sub>3</sub>
0	1	0	1	1	1	1	0 0 0
1	1	0	1	1	0	1	1 0 1
2	1	0	1	1	1	1	1 0 0
3							1 0 1



Hence mod of the circuit will be 2.

B

3

C

4

D

5

QUESTION ANALYTICS

**Q. 43**

Consider the following regular expression:

- I.  $(a + b)^* abb(a + b)^*$
- II.  $(a + b)^* a(a + b)^* bb(a + b)^*$
- III.  $(a + b)^* ab(a + b)^* b(a + b)^*$
- IV.  $(a + b)^* abb(a + b)^* a$

Which of the above regular expressions are equivalent?

FAQ | Have any Doubt?

A

I, III and IV only

B

II, III and IV only



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I and II only

Your answer is Correct

**Solution :**

(d)

I and II generate all strings containing abb as a substring. However in III, abab is accepted which should be a non member if it has to accept abb as substring. IV is also wrong because it not only wants abb as substring, every string should also end with 'a'. Hence the answer is option (d).

QUESTION ANALYTICS

**Q. 44**

Consider the following set of processes that need to be scheduled on a single CPU. Operating system uses preemptive shortest remaining time first algorithm.  
(Ties are broken by using FCFS)

Process	Arrival time	CPU burst time	I/O burst time	CPU burst time after I/O
$P_1$	0	3	2	2
$P_2$	0	2	4	1
$P_3$	2	1	3	2
$P_4$	3	2	2	1

What is the average waiting time (ms) and efficiency (in percentage) of CPU?

(Assume that all processes have their own I/O devices, consider only CPU times as burst time).

Have any Doubt ?

A

5.5, 89.5

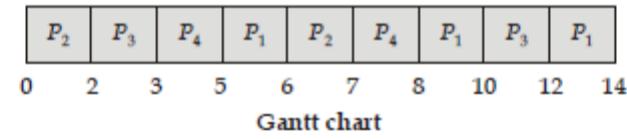
B

5.5, 100

Your answer is Correct

**Solution :**

(b)



Waiting time = Turn around time - Burst time

$$\begin{aligned} \text{Average waiting time} &= \sum_{i=1}^n \frac{\text{Waiting time of } P_i}{\text{Total number of process}} \\ &= \frac{6+4+4+8}{4} = 5.5 \text{ ms} \end{aligned}$$

$$\text{CPU efficiency} = \frac{14}{14} \times 100 = 100\%$$

Process	Waiting
$P_1$	6
$P_2$	4
$P_3$	4
$P_4$	8

So option (b) is correct.

C

6.5, 100

D

6.5, 89.5

QUESTION ANALYTICS

**Q. 45**

A graph G is called self complementary iff G is isomorphic to its complement. Let X be a self complementary graph. Which of the following is a viable possibility with regards to the connectivity of X and  $X'$ , where  $X'$  denotes the complement of X?

Have any Doubt ?



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B

X is connected, X' is disconnected

C

X is disconnected, X' is connected

D

Both X and X' are connected

Your answer is Correct

**Solution :**

(d)

Firstly we know that if two graphs  $G_1$  and  $G_2$  are isomorphic, then either both of them will be connected, or both will be disconnected, and it's easy to argue that a situation like option (b) or (c) can never happen as they are isomorphic.

Now the option (a) violates the theorem "at least one of  $G$  and  $G'$  must be connected" so also ruled out. So the only viable possibility is option (d).

Note that a question based on this concept can probably come in GATE, and they can frame "Every self complementary graph is connected" or "Some self complementary graph is disconnected". So be prepared to answer such questions. So the conclusion is "Every complementary graph is connected".

So option (d) is the correct answer.

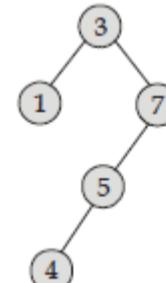
QUESTION ANALYTICS

**Q. 46**

Consider the following function height, to which the pointer to the root node of a binary tree shown below is passed.

Note that  $\max(a, b)$  is defined by the declaration `#define max(a, b) (a > b) ? a : b.`  
`int height(Node *root)`

```
{
    if (!root) return -1;
    if (root->left && !root->right) return 1 + height(root->left);
    if (!root->left && root->right) return 1 + height(root->right);
    return 1 + max(height(root->left), height(root->right));
}
```



The output obtained when the root of the tree given below is passed to the above function is

Have any Doubt ?

A

1

B

2

C

3

Your answer is Wrong

D

None of these

Correct Option

**Solution :**



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 $(a \leq b) : a + b,$ 

In the absence of these brackets, the conditional operator ?: has lower precedence than '+', so the comparison between a and b (leftHeight and rightHeight) will be done and then + will be evaluated before ?, leading to a different result than expected, and it can be verified that program will output -1 for the given input.

## QUESTION ANALYTICS

## Q. 47

Consider 16 bit hypothetical CPU which supports 1 Word long instruction, 250 registers and 1 kB memory space. If there exists 62 1-Address memory reference instructions and 6 1-Address register reference instructions then how many zero Addr instruction are formulated?

A

64

Your answer is Wrong

B

2048

C

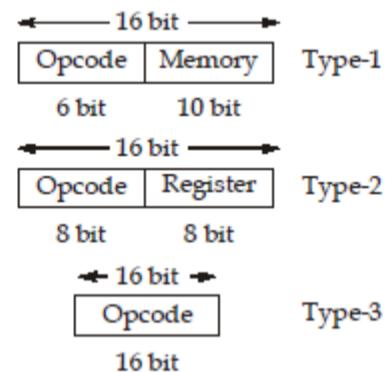
512

Correct Option

## Solution :

(c)

## Instruction format



So, higher order instruction format is the instruction which contain small opcode.

i.e.,

$$\begin{array}{c} \text{6 bit} \quad \text{10 bit} \\ \text{Number of opcodes} = 2^6 = 64 \\ \text{Number of free opcodes} = (64 - 62) = 2 \end{array}$$

$$\begin{array}{c} \text{8 bit} \quad \text{8 bit} \\ \text{Number of Type 2 Instruction possible} = \begin{array}{c} \text{Opcode} \quad \text{Register} \\ \hline \text{8 bit} \quad \text{8 bit} \end{array} \\ = 2 \times 2^8 = 256 \end{array}$$

$$\begin{array}{c} \text{16 bit} \\ \text{Number of free opcodes after Type 2 instruction} = 8 - 6 = 2 \\ \text{Number of Type 3 (0-Addr) instruction possible} = 2 \times 2^8 = 2^9 (512) \end{array}$$

D

256

## QUESTION ANALYTICS

## Q. 48

Let S be a binary search tree with 127 nodes. Let  $x$  and  $y$  denote the maximum and minimum possible height of S. Then the value of  $x$  and  $y$  will be

A

127, 7



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C

126, 6

Your answer is **Correct****Solution :**

(c)

Height will be maximum if the tree is either left skewed or right skewed.

So Max Height =  $x = 127 - 1 = 126$ 

Height will be minimum if S is a complete binary tree.

So Min Height =  $y = \log(127 + 1) - 1$   
 $= \log(128) - 1 = 6$ 

Hence (c) will be the answer.

D

128, 8

QUESTION ANALYTICS

**Q. 49**

Let an array A has n elements, where each element is a natural number. It is known that the array A has exactly 'r' number of inversions. Now every element in the array is made negative. Then the time complexity of the most efficient algorithm which computes the inversion pairs in the modified array A will be

[Have any Doubt ?](#)

A

 $O(n)$ 

B

 $O(n \log n)$ Your answer is **Wrong**

C

 $O(\log n)$ 

D

 $O(1)$ 

Correct Option

**Solution :**

(d)

If array has r inversions, then the modified array will have ( $C_2 - r$ ) inversions. So we don't know the answer and the algorithm simply needs to return this value, which will take constant time.

So the correct choice will be option (d).

QUESTION ANALYTICS

**Q. 50**

Consider the following statements about schedules in database:

 $S_1$  : Dirty read problem is same as write-read conflict. $S_2$  : Unrepeatable reads is also known as read-write conflict. $S_3$  : Strict two phase locking may have read-write conflict.

Which of the above statements are correct?

[Have any Doubt ?](#)

A

Only  $S_1$  and  $S_2$ 

Correct Option

**Solution :**



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$S_3$  : Strict 2PL can not have read-write conflict.  $S_3$  is incorrect  
 So option (a) is true.

B  
 Only  $S_2$  and  $S_3$

C  
 Only  $S_1$  and  $S_3$

D  
 All  $S_1$ ,  $S_2$  and  $S_3$

Your answer is Wrong

QUESTION ANALYTICS

**Q. 51**

Assume we are given 2 algorithms  $A_1$  and  $A_2$ . For an input size ' $n$ ', algorithm  $A_1$  takes  $\theta(n)$  time and  $A_2$  takes  $\theta(n^2)$  time respectively. For  $n = 16$ , algorithm  $A_1$  takes 48 seconds; while  $A_2$  takes 512 seconds respectively. Let  $T(A_1)$  and  $T(A_2)$  denote the time taken by  $A_1$  and  $A_2$  when made to run on an input size  $n = 64$  respectively. Then the value of  $T(A_2) - T(A_1)$  will be equal to

Have any Doubt ?

A  
 192

B  
 4096

C  
 8000

Your answer is Correct

**Solution :**

(c)

**Algorithm ( $A_1$ )**For  $n = 16$ ,  $A_1$  takes 48 seconds

$$\Rightarrow cn = 48$$

$$c(16) = 48 \Rightarrow c = 3$$

So for  $n = 64$ ,  $T(A_1)$  will equal to,

$$T(A_1) = c \cdot n = 3(64) = 192 \text{ seconds}$$

**Algorithm ( $A_2$ )** $n = 16$ , 512 seconds

$$kn^2 = 512$$

$$\text{or } k(16)^2 = 512$$

$$\therefore k = 2$$

Now for  $n = 64$ ,

$$T(A_2) = 2 \times (64)^2 = 2 \times 4096 = 8192 \text{ seconds}$$

$$\begin{aligned} \text{Therefore } T(A_2) - T(A_1) &= (8192 - 192) \text{ seconds} \\ &= 8000 \text{ seconds} \end{aligned}$$

D  
 8192

QUESTION ANALYTICS

**Q. 52**

In a factory, machine A produces 40% of the output and machine B produces 60%. On an average, 9 items in



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A

0.4

B

0.5

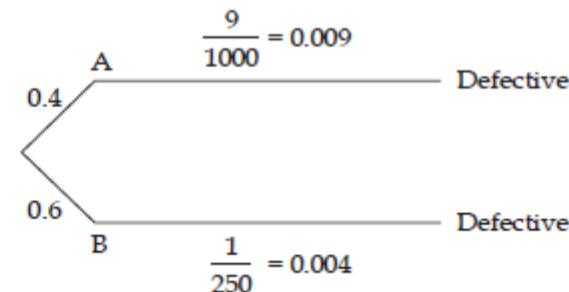
C

0.6

Your answer is Correct

Solution :

(c)



Output produced by A = 40%

$$\therefore P(A) = 0.4$$

Output produced by B = 60%

$$\therefore P(B) = 0.6$$

 Let,  $P\left(\frac{D}{A}\right)$  = probability that item produced by A is defective

$$\therefore P\left(\frac{D}{A}\right) = \frac{9}{1000} = 0.009$$

 Similarly,  $P\left(\frac{D}{B}\right) = \frac{1}{250} = 0.004$ 
 $P\left(\frac{A}{D}\right)$  = Probability that product is produced by A given that it is defective

$$P\left(\frac{A}{D}\right) = \frac{P(A) \times P\left(\frac{D}{A}\right)}{P(A) \times P\left(\frac{D}{A}\right) + P(B) \times P\left(\frac{D}{B}\right)}$$

$$= \frac{0.4 \times 0.009}{0.4 \times 0.009 + 0.6 \times 0.004}$$

$$P\left(\frac{A}{D}\right) = \frac{0.0036}{0.0036 + 0.0024} = \frac{0.0036}{0.006} = 0.6$$

$$\therefore P\left(\frac{A}{D}\right) = 0.6$$

D

0.7

QUESTION ANALYTICS

**Q. 53**

A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations Aerie, Boston, Castle and Daron request 4000, 2000, 4000, and 8000 addresses, respectively and in that order. Which of the following is correct mask for organization Castle?

Have any Doubt ?

A

198.16.24.0/20

Correct Option

Solution :

(a)



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 Castle: 198.16.24.0 - 198.16.39.255 written as 198.16.24.0/20  
 Daron: 198.16.40.0 - 198.16.71.255 written as 198.16.40.0/19

B

198.16.0.0/20

Your answer is Wrong

C

198.16.64.0/19

D

198.16.128.0/20

## QUESTION ANALYTICS

## Q. 54

We are given two languages P and Q over the alphabet {0, 1}, such that  $P = \{1, 01\}$  and  $Q = P \cup \{Q^0\}$ . Now consider the following strings.

- I.  $(01)^{63}$
- II.  $(01)^{64}$
- III.  $(10)^{63} 1$
- IV.  $(01)^{65}$

Let X denote the number of strings from above, belonging to  $P^{64}$ . Similarly let Y denote the number of strings present in  $Q^{64}$ . Then the value of  $10X + 4Y$  will be equal to \_\_\_\_\_.

Have any Doubt?

32

Your answer is Correct 32

## Solution :

32

Given,  $P = \{1, 01\}$ ,  $Q = P \cup Q^0$ Since  $Q^0 = \epsilon$ ,  $Q = \{1, 01, \epsilon\}$ 

Now let's first find the value of X.

The strings I and IV don't belong to  $P^{64}$ .It's quite easy to see that the second string i.e.  $(01)^{64}$  belongs to  $P^{64}$ .Lets see why  $(10)^{63} 1$  belongs to  $P^{64}$  as well: $(10)^{63} 1$  is same as,  $1(01)^{63}$  [using  $(pq)^n = p^n q^n$ ]So clearly we can see that the 3<sup>rd</sup> string -  $1(01)^{63}$  belongs to P as we can break down the string 64 pieces (each of these pieces must belong to the language); the first piece being '1' and remaining 63 pieces being 01.Since  $1(01)^{63}$  belongs to  $P^{64} \Rightarrow (10)^{63} 1$  also belongs to  $P^{64}$ .Therefore  $X = 2$ 

Now let's find Y

Since Q is a superset of P, II and III will automatically become a member of  $Q^{64}$ . Because of presence of epsilon in Q, the string I i.e.  $(01)^{63}$  will also belong to  $Q^{64}$ , as the presence of epsilon allows a breakdown of pieces less than 64 as well. So we can make the first 63 pieces equal to 1 and the last piece as  $\epsilon$ . But even here IV cannot be generated, as null string allows us to cut down the number of pieces used, but can't increase them.

So  $Y = 3$ Therefore  $10X + 4Y = 10(2) + 4(3) = 32$ 

## QUESTION ANALYTICS

## Q. 55

Consider a graph G with  $2^n$  vertices, where the label of each vertex is a n bit binary string represented as  $a_0 a_1 a_2 \dots a_{n-1}$ , where each  $a_i$  is 0 or 1 respectively. Two vertices  $u(u_0 u_1 \dots u_{n-1})$  and  $v(v_0 v_1 \dots v_{n-1})$  are adjacent if and only if the labels of u and v satisfy the condition



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138

Correct Option

**Solution :**

138

The condition for adjacency here says that, the two strings should either start with same bit and end with different bits, OR have different starting bit and end with the same bit. So we have 4 types of vertices.

Vertex Type	Adjacent Vertices	Degree of the Vertex
0 _____ 0	0 _____ 1, 1 _____ 0	$2^6 + 2^6 = 128$
0 _____ 1	1 _____ 1, 0 _____ 0	$2^6 + 2^6 = 128$
1 _____ 0	0 _____ 0, 1 _____ 1	$2^6 + 2^6 = 128$
1 _____ 1	0 _____ 1, 1 _____ 0	$2^6 + 2^6 = 128$

The blanks in between the vertices ( \_\_\_\_\_ ) can be either 0 or 1. So we can clearly see that every vertex will have same degree, equal to 128.

So  $x = 128$

Also it can be easily verified that there will be exactly one component.

So  $y = 1$

So  $x + 10y = 138$

*Note:* An alternate way of solving this problem is shown in the video solution of this question. You can refer to it after it is uploaded.

QUESTION ANALYTICS

**Q. 56**

Consider the following statements:

$S_1$  : HTTP resources are identified and located on the network by uniform resource locators.

$S_2$  : FTP may run in active or passive mode, which determines how the data connection is established.

$S_3$  : MIME extension used for sending graphics and multimedia in SMTP.

The number of correct statements are \_\_\_\_\_.

Have any Doubt ?

3

Correct Option

**Solution :**

3

- $S_1$  is correct.
- $S_2$  is correct because in active mode the clients starts listening for incoming data connection from the server on some random port number by informing the server about their port number on which it is listening.

In situations where the clients is behind a firewall and unable to accept incoming connections, passive mode may be used.

- $S_3$  is correct.

Your Answer is 2

QUESTION ANALYTICS

**Q. 57**

Consider the following cache A and B. Let the average access times in cache A and B is  $t_A$  and  $t_B$  respectively. The value of  $t_A + t_B$  is \_\_\_\_\_ (in ns).

(Upto 2 decimal places)





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80 ns main memory access time	15% miss rate in $L_2$
3 ns $L_1$ Access time	6 ns $L_2$ Access time
80 ns main memory access time	

31.20 (31.00 - 31.22)

Have any Doubt ?

Correct Option

**Solution :**

31.20 (31.00 - 31.22)

'A' is slower than B.

**Cache A**

$$\text{Average access time} = H(L_1 \text{ Access time}) + (1 - H) (L_1 \text{ Cache access time} + \text{Memory access time})$$

$$t_A = 0.8(5 \text{ ns}) + 0.2(5 \text{ ns} + 80 \text{ ns}) \\ = 21 \text{ ns}$$

**Cache B**

$$\text{Average access time} = H_1 T_1 + (1 - H_1) H_2(T_2 + T_1) + (1 - H_1)(1 - H_2)H_3(T_3 + T_2 + T_1) \\ = (0.6 \times 3) + (1 - 0.6)(0.85)(6 + 3) + (1 - 0.6)(1 - 0.85)(6 + 3 + 80)$$

$$t_B = 10.2 \text{ ns} \\ t_A + t_B = 21 + 10.2 = 31.2 \text{ ns}$$

Your Answer is 29.10

QUESTION ANALYTICS

**Q. 58**

Consider the following grammar:

$$\begin{aligned} S &\rightarrow bbB \\ B &\rightarrow bb \mid C \\ C &\rightarrow e \mid D \\ D &\rightarrow dg \mid \epsilon \end{aligned}$$

Number of states in SLR(1) construction which contain any conflict (Both shift-reduce and reduce-reduce)

\_\_\_\_\_.

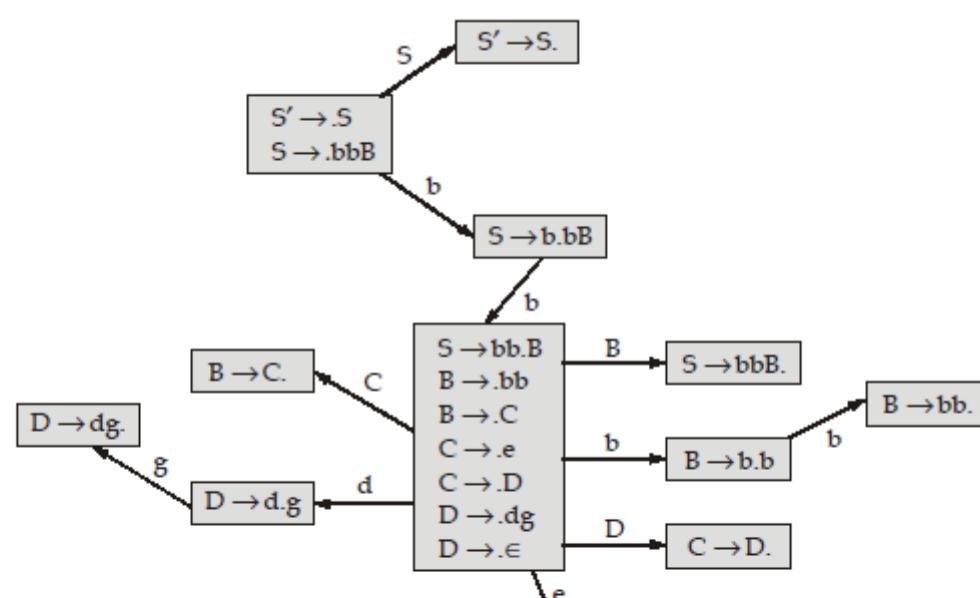
Have any Doubt ?

0

Your answer is **Correct**0**Solution :**

0

SLR(1) construction





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## QUESTION ANALYTICS

## Q. 59

The number of different insertion sequences of numbers {7, 20, 32, 50, 66, 77} on an initially empty hash table H of size 6 and a hash function  $h(k) = k \bmod 6$  with linear probing scheme for collision resolution such that the hash table obtained after the insertion looks as shown in the figure below is equal to \_\_\_\_\_.

66	7	20	32	50	77
0	1	2	3	4	5

Have any Doubt?

Your answer is **Correct** 120

120

## Solution :

120

Let's see the places to which the numbers get mapped according to hash function given.

 $66 \rightarrow 0$ 
 $7 \rightarrow 1$ 
 $20 \rightarrow 2$ 
 $32 \rightarrow 2$ 
 $50 \rightarrow 2$ 
 $77 \rightarrow 5$ 

Since we have to find the number of insertion sequences possible, we have to note here, the numbers 20, 32, and 50 get mapped to the same index (2) in the hash table, as we can see from calculations above, but 7, 66 and 77 can come in any order. So in order to obtain the required table, the order between 20, 32 and 50 should be maintained. In order to do this, we will choose 3 out of 6 positions, that is  ${}^6C_3$  and then place 20, 32, 50 there in 1 way.

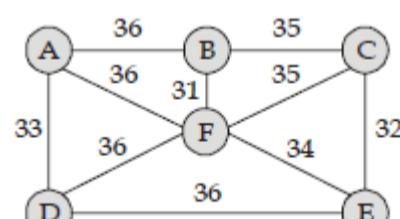
Now we are left with 7, 66 and 77 which can be filled in the remaining 3 places in  $3!$  ways without any problem.

So the answer will be  ${}^6C_3 * 3! = 20 * 6 = 120$

## QUESTION ANALYTICS

## Q. 60

Let X be the weight of the minimal spanning tree for the following graph. Then the value of X is \_\_\_\_\_.



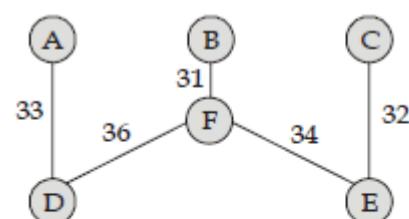
Have any Doubt?

166

Your answer is **Correct** 166

## Solution :

166



∴

$$\text{Weight} = 33 + 36 + 31 + 34 + 32 = 166$$



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**Q. 61**

If a number  $x$  is selected from natural numbers 1, 2, ..., 100; then the probability that  $x$  follows

$$x + \frac{100}{x} > 29 \text{ is } \underline{\hspace{2cm}}. \text{ (Upto 2 decimal places)}$$

Have any Doubt ?

0.78 (0.70 - 0.80)

Your answer is Correct.75

**Solution :**

0.78 (0.70 - 0.80)

$$\begin{aligned} x + \frac{100}{x} &> 29 \\ \Rightarrow x^2 - 29x + 100 &> 0 \\ (x - 4)(x - 25) &> 0 \\ \therefore x &< 4 \quad \text{or} \quad x > 25 \\ \Rightarrow x \in (1, 2, 3, 26, 27, \dots, 100) & \\ \therefore \text{favorable no. of cases} &= 78 \\ \Rightarrow \text{The required probability} &= \frac{78}{100} = 0.78 \end{aligned}$$

## QUESTION ANALYTICS

**Q. 62**

Consider the following resources allocation table given below:

Process	Current allocation			Maximum need			Available		
	P	Q	R	P	Q	R	P	Q	R
$P_0$	2	1	1	5	1	1	$a$	$b$	$c$
$P_1$	0	1	1	3	2	1			
$P_2$	3	0	2	3	0	3			
$P_3$	1	0	1	4	2	2			
$P_4$	0	2	3	2	5	4			

If  $a, b, c$  is minimum value of resources P, Q, R respectively such that the system is in safe state then value of  $(a + b + c)$  is \_\_\_\_\_.

Have any Doubt ?

2

Correct Option

**Solution :**

2

$P_2$  maximum need (3, 0, 3) and  $P_2$  current allocation (3, 0, 2).

So  $P_2$  current need is (0, 0, 1)

Minimum 1 instance of resource R is needed, after that  $P_0, P_1, P_3$  can execute but for  $P_4$  to ex-

3 instances of resource Q is needed but only 2 is available so 1 more instance of Q is needed

So minimum instance of resource P, Q, R needed is (0, 1, 1) so value of  $a + b + c = 0 + 1 + 1 = 2$

Your Answer is 1

## QUESTION ANALYTICS

**Q. 63**

Suppose that Alice and Bob want to exchange an e-mail. For this they setup a common secret (D – H key) for encryption and decryption using Diffie Hellman key exchange. They agreed on modulus 11 and 2 as



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9

Correct Option

**Solution :**

9

Given,

$$\begin{aligned} P &= 11 \\ g &= 2 \\ X_A &= 9 \quad [X_A = \text{Alice key}] \\ X_B &= 4 \quad [X_B = \text{Bob key}] \end{aligned}$$

So,

$$\begin{aligned} y_A &= 2^{X_A} \\ &= 2^9 \pmod{11} \\ &= 2 \times 2^8 \pmod{11} \\ &= 2 \times (2^4)^2 \pmod{11} \\ &= 2 \times (5^2) \pmod{11} \\ &= 2 \times 3 \pmod{11} = 6 \end{aligned}$$

$$\begin{aligned} y_B &= 2^{X_B} \\ &= 2^4 \pmod{11} = 5 \end{aligned}$$

Now,

$$\begin{aligned} Z_A &= y_B^{X_A} \\ &= 5^9 \pmod{11} \\ &= (5^2)^4 \times 5 \pmod{11} \quad [5^2 \pmod{11} = 3] \\ &= 5 \times (3)^4 \pmod{11} \\ &= 5 \times (3)^3 \times 3 \pmod{11} \\ &= (5^2) \times 3 \pmod{11} \\ &= 3 \times 3 \pmod{11} = 9 \end{aligned}$$

$$\begin{aligned} Z_B &= y_A^{X_B} \\ &= 6^4 \pmod{11} \\ &= (6^2)^2 \pmod{11} \\ &= 9 \pmod{11} \end{aligned}$$

$$\begin{aligned} Z_A &= Z_B = 9 \\ D - H \text{ key} &= 9 \end{aligned}$$

QUESTION ANALYTICS

**Q. 64**

A pair of dice is rolled together till a sum of either 5 or 7 is obtained. The probability that 5 comes before 7 is \_\_\_\_\_ (Upto 2 decimal places)

Have any Doubt ?

0.40 (0.39 - 0.41)

Correct Option

**Solution :**

0.40 (0.39 - 0.41)

Let,  $E_1$  = event of getting a sum of 5 in a roll of 2 die  
 $= \{(1, 4), (2, 3), (3, 2), (4, 1)\}$

$$P(E_1) = \frac{n(E_1)}{n(s)} = \frac{4}{36} = \frac{1}{9}$$

$$\begin{aligned} E_2 &= \text{Event of getting a sum of either 5 or 7} \\ &= \{(1, 4), (2, 3), (3, 2), (4, 1), (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)\} \\ P(E_2) &= \frac{n(E_2)}{n(s)} = \frac{10}{36} = \frac{5}{18} \end{aligned}$$

Probability of getting neither 5 nor 7,

$$P(\bar{E}_2) = 1 - P(E_2) = 1 - \frac{5}{18} = \frac{13}{18}$$

The event of getting 5 before 7

$$= E_1 \cup (\bar{E}_2 E_1) \cup (\bar{E}_2 \bar{E}_2 E_1) \cup \dots \text{to } \infty$$



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$$\begin{aligned}
 &= \frac{1}{9} + \frac{13}{18} \cdot \frac{1}{9} + \frac{13}{18} \cdot \frac{13}{18} \cdot \frac{1}{9} + \dots + \dots^{\infty} \\
 &= \frac{1}{9} \left[ 1 + \frac{13}{18} + \left( \frac{13}{18} \right)^2 + \dots \right] \\
 &= \frac{1}{9} \cdot \frac{1}{1 - \frac{13}{18}} = \frac{1}{9} \cdot \frac{18}{5} = \frac{2}{5} = 0.4
 \end{aligned}$$

**QUESTION ANALYTICS**
**Q. 65**

Consider the following partial order relations:

 I.  $(Z^+, \leq)$ 

 II.  $(Z^-, \leq)$ 

 III.  $(Z^+, \geq)$ 

 IV.  $(Z^-, \geq)$ 

 Note that  $Z^+$  and  $Z^-$  denote the set of positive integers and the set of negative integers respectively. How many of the above POSETs are well ordered?

[Have any Doubt ?](#)

Correct Option

2

**Solution :**

2

I and IV are well ordered, as both are not only discrete, but also have a least element as well. II and III don't have least element, therefore are not well ordered.

**QUESTION ANALYTICS**