



Kunal Jha  
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 Computer Science Engineering(CS)

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## FULL SYLLABUS TEST-7 (ADVANCE LEVEL) GATE 2020 - REPORTS

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**Q. 1**
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Archaeologists should make greater use of satellite images in their search for Mayan ruins in the jungles of Guatemala. Though satellite photographs have proven unhelpful because of their inability to penetrate the dense tree canopy, infrared imaging translates heat signatures into distinct colors, making previously-undiscovered ruins visible. The conclusion above is based on which of the following assumptions?

**A** Infrared imaging is helpful because the heat signature of ruin sites is different from the heat signature of the surrounding jungle. Correct Option

**Solution :**

(a)

Facts :

Archaeologists should make greater use of satellite images.

Though satellite photographs have proven unhelpful because of their inability to penetrate the dense tree canopy.

Conclusion :

Infrared imaging translates heat signatures into distinct colors, making previously-undiscovered ruins visible.

The conclusion is based on the fact that infrared images give us more information than satellite photographs do.

Therefore we are looking for such assumption, and the only one that guarantees so is option (a). Infrared imaging is helpful because the heat signature of ruin sites is different from the heat signature of the surrounding jungle. so infrared images will make "previously-undiscovered ruins visible".

**B** Archaeologists in the field have not been able to discover many ruins because the jungle is impenetrable.

**C** Archaeologists use both satellite technology and local folklore to theorize the location of ruins.

**D** Archaeologists require special training in order to read maps produced by infrared imaging.

[QUESTION ANALYTICS](#)

**Q. 2**
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Which of the phrases given below should replace the phrase printed in bold type to make it grammatically correct?  
 Despite of their differences on matters of principles, they all agree on the demand of hike in salary

**A** Despite their Correct Option

**Solution :**

(a)

"Despite their" in place of "Despite of their".

**B** Despite of them

**C** Despite for their

**D** Despite off their

[QUESTION ANALYTICS](#)

**Q. 3**
[▶ Solution Video](#)
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$2^x = 4^y = 8^z$  and  $xyz = 288$ , then value of  $\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z}$  is:

**A**  $\frac{11}{12}$

**B**  $\frac{11}{96}$  Correct Option

**Solution :**

(b)

$$2^x = 4^y = 8^z \Rightarrow 2^x = 2^{2y} = 2^{3z}$$

$$\Rightarrow x = 2y = 3z = k \text{ (say)}$$

$$\text{Then } xyz = \frac{k^3}{6} = 288 \Rightarrow k = 12$$

$$\therefore x = 12, y = 6, z = 4$$

$$\Rightarrow \frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{11}{96}$$

**C**  $\frac{29}{96}$

**D** none of these

Q. 4

[▶ Solution Video](#)[Have any Doubt ?](#)

Dinesh and Sunil run with the speeds of 30 m/s and 20 m/s around a circular track of 600 m. They participate in a 3000 m race. What is the distance covered by Dinesh when he passes Sunil for the 5<sup>th</sup> time?

 A 2200 m B 2250 m C 2850 m D none of these

Correct Option

**Solution :**

(d)

$$\text{Time taken by them to meet} = \frac{600}{30-20} = 60\text{s}$$

$$\text{Time taken to meet 5th time} = 5 \times 60 = 300\text{s}$$

$$\text{Total duration of race} = \frac{3000}{30} = 100\text{s}$$

So, they will not meet 5<sup>th</sup> time in the race of 3000 metre.

Q. 5

[▶ Solution Video](#)[Have any Doubt ?](#)

If a, b, c are all positive, then the minimum value of the expression  $\frac{(a^2 + a + 1)(b^2 + b + 1)(c^2 + c + 1)}{abc}$  is \_\_\_\_\_

 27

Correct Option

**Solution :**

27

The expression will have minimum value of the expression when a = b = c.

Therefore, the required minimum value

$$= \frac{(1+1+1)}{1} \times \frac{(1+1+1)}{1} \times \frac{(1+1+1)}{1} = 27$$

Q. 6

[▶ Solution Video](#)[Have any Doubt ?](#)

One theory of the Moon's origin is that the Earth, early in its development, was a rapidly rotating body of molten rock in which most of the iron had settled to the core; some of this fluid was cast off from the surface of the spinning mass and later solidified to form the Moon. Which of the following conclusions can best be supported by the theory above of the Moon's origin, if that theory is correct?

 A The Moon is the only sizeable heavenly body in orbit around the Earth. B The Moon has proportionally less iron at its core than the Earth does.

Correct Option

**Solution :**

(b)

(A) The Moon is the only sizeable heavenly body in orbit around the Earth. Not mentioned in argument.

(B) The Moon has proportionally less iron at its core than the Earth does. the theory supports this option because it's mentioned in theory that Earth was a rapidly rotating body of molten rock in which most of the iron had settled to the core; some of this fluid was cast off from the surface of the spinning mass and later solidified to form the Moon.

(C) The surface of the Moon solidified after the surface of the Earth did. Not mentioned in argument, although later solidified to form the Moon points to an assumption that Moon solidified after Earth, but we aren't sure about that. We have to choose option that is best among all 5 options.

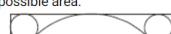
(D) Most of the fluid cast off from the Earth was dispersed into outer space. Not mentioned.

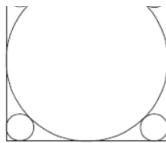
 C The surface of the Moon solidified after the surface of the Earth did. D Most of the fluid cast off from the Earth was dispersed into outer space.

Q. 7

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Given is a square, in which a circle is inscribed touching all the sides of square. In the four corners of square 4 smaller circles of equal radii are drawn, containing maximum possible area.





What is the ratio of the area of larger circle to that of sum of the areas of four smaller circles?

**A**  $1:(68 - 48\sqrt{2})$

Correct Option

Solution :

(a)

In the diagram given,

$$OA = AB = BC = OC = OP$$

Let  $OA = R$  (radius of the larger circle) then  $OB = R\sqrt{2}$

Similarly  $PQ = MQ = QR = r$

(radius of the smaller circle)

$$\text{then } BQ = r\sqrt{2}$$

$$\therefore BP = r + r\sqrt{2}$$

and

$$BP = OB - OP = R\sqrt{2} - R$$

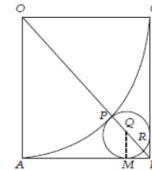
$$R(\sqrt{2} - 1) = r(\sqrt{2} + 1)$$

$$r = R(\sqrt{2} - 1)^2$$

$$r = R(3 - 2\sqrt{2})$$

$$\therefore \frac{\text{Area of larger circle}}{\text{Area of smaller circle}} = \frac{\pi R^2}{4\pi r^2}$$

$$= \frac{R^2}{4(3 - 2\sqrt{2})^2 R^2} = \frac{1}{4(17 - 12\sqrt{2})}$$



**B**  $1:17\sqrt{2}$

**C**  $3:(34 - 12\sqrt{2})$

**D** none of these

QUESTION ANALYTICS

+

Q. 8

Solution Video

Have any Doubt ?

QUESTION

A man takes a step forward with probability 0.4 and backward with probability 0.6. The probability that at the end of eleven steps he is one step away from the starting point is :

**A**  ${}^{11}C_6 \times (0.1)^{11}$

**B**  ${}^{11}C_6 \times (0.24)^5$

Correct Option

Solution :

(b)

The man will be one step away from the starting point if (A) either he is one step ahead or (B) one step behind the starting point.

Therefore, required probability =  $P(A) + P(B)$

The man will be one step ahead at the end of eleven steps if he moves six steps forward and five steps backward. The probability of this event =  ${}^{11}C_6 \times (0.4)^6 \times (0.6)^5$

The man will be one step behind at the end of the eleven steps if he moves six steps backward and five steps forward.

The probability of this event =  ${}^{11}C_6 \times (0.6)^6 \times (0.4)^5$

Hence, the required probability

$$= {}^{11}C_6 \times (0.4)^6 \times (0.6)^5 + {}^{11}C_6 \times (0.6)^6 \times (0.4)^5 \\ = {}^{11}C_6 \times (0.4)^5 \times (0.6)^5 \times (0.4 + 0.6) = {}^{11}C_6 \times (0.24)^5$$

**C**  ${}^{11}C_6 \times (0.2)^{11}$

**D** None of these

QUESTION ANALYTICS

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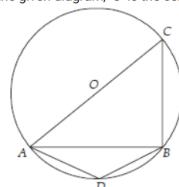
Q. 9

Solution Video

Have any Doubt ?

QUESTION

In the given diagram, 'O' is the centre of the circle and AC is the diameter.  $\angle ADG$  is  $120^\circ$ . Radius of the circle is 6 cm, what is the area of the triangle ABC?



**A**  $18\sqrt{3} \text{ cm}^2$

Correct Option

**Solution :**

(a)

and  $\angle ACB = 60^\circ$   $(\because \angle ACB + \angle ADB = 180^\circ)$   
 $\angle CAB = 30^\circ$   $(\because \angle ACB + \angle CAB = 90^\circ)$

$AC = 2 \times 6 = 12 \text{ cm}$

$\frac{BC}{AC} = \sin 30^\circ = \frac{1}{2}$

$\Rightarrow BC = 6 \text{ cm}$

and  $\frac{BC}{AB} = \tan 30^\circ = \frac{1}{\sqrt{3}}$

$\Rightarrow AB = 6\sqrt{3} \text{ cm}$

$\therefore \text{Area of } \triangle ABC = \frac{1}{2} \times 6 \times 6\sqrt{3} = 18\sqrt{3} \text{ cm}^2$

**B**  $24\sqrt{3} \text{ cm}^2$

**C**  $27 \text{ cm}^2$

**D** Data insufficient

QUESTION ANALYTICS

+

**Q. 10**

Solution Video

Have any Doubt ?

□

In a hostel of 100 students capacity, 42 are science graduate, 34 are law graduate and 58 are commerce graduate, 8 students are science and law graduate, 13 students are law and commerce graduate, 18 students are commerce and science graduate. The number of students who are only science graduate is \_\_\_\_\_

**21**

Correct Option

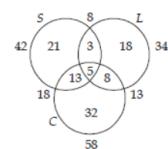
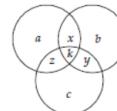
**Solution :**

21

Let,  $\alpha = a + b + c$   
 $\beta = x + y + z$   
 $\gamma = k$

According to the question,

$$\begin{aligned}\alpha + \beta + \gamma &= 100 \\ \alpha + 2\beta + 3\gamma &= 42 + 34 + 58 = 134 \\ \beta + 3\gamma &= 8 + 13 + 18 = 39 \\ \alpha + \beta &= (\alpha + 2\beta + 3\gamma) - (\beta + 3\gamma) \\ &= 134 - 39 = 95 \\ \therefore \gamma &= (\alpha + \beta + \gamma) - (\alpha + \beta) \\ \gamma &= 100 - 95 = 5 \\ \therefore \text{Number of students who are only science graduate} &= 42 - [(18 + 8) - 5] \\ &= 42 - (13 + 3 + 5) = 21\end{aligned}$$



QUESTION ANALYTICS

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**Q. 11**
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The number of states in the minimal finite automata corresponding to the language consisting of the set of strings containing at most  $2^m$  0's over the unary alphabet {0} is equal to

**A**  $2^m$  states

**B**  $2^m + 1$  states

Correct Option

**Solution :**

(b) Minimal DFA for strings having at most  $x$  a's needs  $(x + 1) + 1$  states [1 more state required for trap state].

But note that the question says 'Minimal FA', which need not mean DFA. And since the question asks for the minimum number of states, we'll go for Minimal NFA, so we can remove the trap state to get the minimal NFA, and therefore the answer will be  $(x + 1)$ .

So putting  $x$  as  $2^m$ , we get (b) as the answer.

**C**  $2^m + 2$  states

**D** None of these

QUESTION ANALYTICS


**Q. 12**
[Have any Doubt ?](#)


Consider the following C function:

```
void fun (int n)
{
    if (n > 0)
    {
        printf("GATE");
        fun (n - 1);
    }
    printf("2020");
    printf("2020");
}
```

What would it print when `fun(n)` called for some positive integer  $n$ ?

**A**  $n$  times "GATE" followed by  $2n$  times "2020"

**B**  $n$  times "GATE" followed by  $2n$  times "2020" alternatively one after another

**C**  $2n + 1$  times "2020" followed by  $n$  times "GATE"

**D**  $n$  times "GATE" followed by  $2(n + 1)$  times "2020"

Correct Option

**Solution :**

(d)  
Option (d) is correct.  
The `fun(n)`, print  $n$  times "GATE" followed by  $2n + 2$  times "2020".

QUESTION ANALYTICS


**Q. 13**
[▶ Solution Video](#)
[Have any Doubt ?](#)


Let  $L_1 = \{011, 00, 000\}$  and  $L_2 = \{110, 000, 00\}$  and  $\Sigma = \{0, 1\}$ .

The number of post correspondence solutions for  $L_1$  and  $L_2$  is equal to

**A** 0

**B** 1

**C** 2

**D** 3

Correct Option

**Solution :**

(d)  
There are totally 3 PCP solutions.

Given,  $L_1 = (011, 00, 00)$

$x_1 \quad x_2 \quad x_3$

and  $L_2 = (110, 000, 00)$

$x_1 \quad x_2 \quad x_3$

Then the PCP solutions are  $x_3x_2$ ,  $x_2x_1x_3$  and  $x_2x_3$  respectively.

Hence 3 is the correct answer.

QUESTION ANALYTICS

Q. 14

Solution Video

Have any Doubt?

The designers of a cache system need to reduce the number of cache misses that occur in a certain group of programs. Which of the following statements is/are true?  
I. If compulsory misses are most common, then the designers should consider increasing the cache line size to take better advantage of locality.  
II. If capacity misses are most common, then the designers should consider increasing the total cache size so it can contain more lines.  
III. If conflict misses are most common, then the designers should consider increasing the cache's associativity, in order to provide more flexibility when a collision occurs.

A III only

B I and II only

C II and III only

D I, II and III

Correct Option

Solution :

(d)

Increasing the cache line size brings in more from memory when a miss occurs. If accessing a certain byte suggests that nearby bytes are likely to be accessed soon (locality), then increasing the cache line essentially pre fetches those other bytes. This, in turn, forestalls a later cache miss on those other bytes. If misses occur because the cache is too small, then the designers should increase the size!

Conflict misses occur when multiple memory locations are repeatedly accessed but map to the same cache location. Consequently, when they are accessed, they keep kicking one another out of the cache. Increasing the associativity implies that each chunk of the cache is effectively doubled so that more than one memory item can rest in the same cache chunk.

QUESTION ANALYTICS

Q. 15

Solution Video

Have any Doubt?

Consider the following statement:

I. Finding median of two sorted array each of size  $n$  has time complexity of  $O(n)$ .

II. Merge sort with no extra space has time complexity  $O(n^2)$ .

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

A I only

B II only

Correct Option

Solution :

(b)

Finding median of two sorted array of size  $n$  has complexity  $O(\log n)$  binary search will be used. Merge sort is outplace algorithm, if extra space is not allowed it takes  $O(n^2)$  time.

C Both I and II

D Neither I nor II

QUESTION ANALYTICS

Q. 16

Solution Video

Have any Doubt?

In an undirected graph  $G$  with  $n$  vertices, vertex 1 has degree 1, while each vertex  $2, \dots, n-1$  has degree 10 and the degree of vertex  $n$  is unknown. Which of the following statement must be TRUE on the graph  $G$ ?

A There is a path from vertex 1 to vertex  $n$ .

Correct Option

Solution :

(a)

Only option (a) is true, rest all are false. This is a consequence of a theorem which says "If there are 2 vertices  $x$  and  $y$ , of odd degree in  $G$ , then there must be a path between  $x$  and  $y$  in  $G$ ".

Hence only (a) is true.

B There is a path from vertex 1 to each vertex  $2, \dots, n-1$ .

C Vertex  $n$  has degree 1.

D All of the above

QUESTION ANALYTICS

Q. 17

[▶ Solution Video](#)[Have any Doubt ?](#)

Which of the following statement is correct for deadlock avoidance algorithm?

- A Every safe sequence lead to deadlock in the system
- B Every unsafe system lead to deadlock
- C Every deadlock has safe sequence
- D Every deadlock is unsafe

Correct Option

**Solution :**

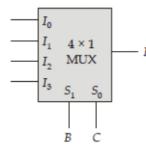
- (d)  
A system is safe state if there exist safe sequence otherwise it is in unsafe state.  
(a) If safe sequence exist then no deadlock occurs in system.  
(b) Unsafe system may lead to deadlock.  
(c) Deadlock has no safe sequence.  
(d) Every deadlock is unsafe but every unsafe system may not be in deadlock.

**QUESTION ANALYTICS**

Q. 18

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider the digital circuit given below:



Which of the following is correct input  $(I_0, I_1, I_2, I_3)$  respectively for implementing function

$$F(A, B, C) = \bar{A}C + \bar{B}C + AB\bar{C}$$

- A  $(A, 1, 0, 1)$

- B  $(0, 1, A, \bar{A})$

Correct Option

**Solution :**

(b)  
Given,  $F(A, B, C) = \bar{A}C + \bar{B}C + AB\bar{C}$

Truth table:

Minterm	A	B	C	$F(A, B, C)$
0	0	0	0	0
1	0	0	1	1
2	0	1	0	0
3	0	1	1	1
4	1	0	0	0
5	1	0	1	1
6	1	1	0	1
7	1	1	1	0

Implementation table:

	$I_0$	$I_1$	$I_2$	$I_3$
$A'$	0	1	2	3
A	4	5	6	7
	0	1	A	$A'$

So, the input  $(I_0, I_1, I_2, I_3) = (0, 1, A, \bar{A})$ 

Hence option (b) is correct.

- C  $(1, 0, 1, A)$

- D  $(A, A, 0, 1)$

**QUESTION ANALYTICS**

Q. 19

[▶ Solution Video](#)[Have any Doubt ?](#)

Which of the following is false to deploy a router?

- A Router are by default broadcast domain separator.
- B Router is not a multi protocol device.
- C All the interface of the router must belongs to same network.

Correct Option

**Solution :**

(c)  
Router are by default broadcast domain separation and not a multi protocol device.

D None of these

QUESTION ANALYTICS



Q. 20

Have any Doubt ?



What will be the output of the following C code?

```
#include <stdio.h>
int main ()
{
    int a = 25;
    int b = 2;
    printf("6 + a/5 * b = % i\n", 6 + 5 * b);
    return 0;
}
```

A 6 + a/5 \* b = 16

Correct Option

Solution :

(a)  
The given C program correctly outputs:  $6 + a/5 * b = 16$ .  
Hence option (a) is correct.

B 16

C Compilation error

D Compiler dependent output

QUESTION ANALYTICS



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Q. 21

Solution Video

Have any Doubt ?



The eigen vectors of  $\begin{bmatrix} 3 & 1 \\ -1 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \lambda \begin{bmatrix} x \\ y \end{bmatrix}$  is

**A**  $c \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

Correct Option

Solution:

$$(a) \begin{vmatrix} 3-\lambda & 1 \\ -1 & 5-\lambda \end{vmatrix} = 0$$

$$(3-\lambda)(5-\lambda) + 1 = 0$$

$$15 - 3\lambda - 5\lambda + \lambda^2 + 1 = 0$$

$$\lambda^2 - 8\lambda + 16 = 0$$

$$\lambda = 4, 4$$

$$[A - \lambda I]X = 0$$

$$\begin{bmatrix} 3 & 1 \\ -1 & 5 \end{bmatrix} - 4 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

Assign  $x = y = c$   
 Hence there is one eigen vector

$$X = c \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

**B**  $c \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

**C**  $c \begin{bmatrix} 1 \\ -1 \end{bmatrix}$

**D**  $c \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

QUESTION ANALYTICS



Q. 22

Solution Video

Have any Doubt ?



The value of the expression  $(333\dots3)^2 + (444\dots4)$  is equal to

**A**  $\frac{4}{9}(10^{2n} - 1)$

Correct Option

**B**  $\frac{1}{9}[(10^n + 1)^2 - 4]$

Solution:

(b)

$$(333\dots3)_{n \text{ digits}} = 3 + 3 \times 10^1 + 3 \times 10^2 + \dots + 3 \times 10^{n-1}$$

$$= \frac{3(10^n - 1)}{(10 - 1)} = \frac{10^n - 1}{3}$$

$$\text{Similarly } (444\dots4)_{n \text{ digits}} = \frac{4}{9}(10^n - 1)$$

So the expression becomes,

$$\frac{(10^n - 1)^2}{9} + \frac{4}{9}(10^n - 1) = \frac{1}{9}[(10^n + 1)^2 - 4]$$

Hence option (b) is the correct answer.

**C**  $\frac{2}{9}[10^n + 1]$

**D** None of these

QUESTION ANALYTICS



Q. 23

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider the following modified 2 phase locking protocol: Before a transaction T writes a data object A, T has to obtain an exclusive lock on A. Before a transaction T reads a data object A, T has to obtain a shared lock on A. If exclusive locks are held until the end of transaction and shared locks can be released at any time then which of the following properties are guaranteed?

- A Conflict serializability
- B Recoverability
- C Avoids cascading rollbacks
- D All of the above

Correct Option

**Solution :**

(d)

The given locking protocol follows the properties of strict 2 PL which is conflict serializable, recoverable and avoid cascading rollbacks.



Q. 24

[▶ Solution Video](#)[Have any Doubt ?](#)

Let  $u(n) = n \prod_{p|n} \left(1 - \frac{1}{p}\right)$  where " $\frac{p}{n}$ " means " $p$  divides  $n$ " i.e.,  $p$  runs over all the primes dividing  $n$ .

Then what is the value of  $u(54)$ ?

- A 12
- B 18
- C 24
- D 30

Correct Option

**Solution :**

(b)

For  $n = 54$ , its prime divisors are 2 and 3.  
hence we need to find

$$\begin{aligned} u(54) &= n \prod_{p|n} \left(1 - \frac{1}{p}\right) \\ u(54) &= 54 \left[ \left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{3}\right) \right] \\ &= 54 \times \frac{1}{2} \times \frac{2}{3} = 18 \end{aligned}$$

Hence option (b) is the correct answer.

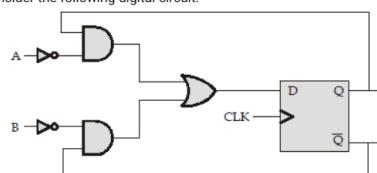
- A 12
- B 18
- C 24
- D 30



Q. 25

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider the following digital circuit:



The circuit shown is

- A JK flip-flop with input A = K and B =  $\bar{J}$
- B JK flip-flop with input A =  $\bar{K}$  and B = J
- C SR flip-flop with input A = S and B = R

Correct Option

**Solution :**

(a)

In the given circuit

$$\begin{aligned} Q_{n+1} &= D \\ &= \bar{A}Q + \bar{B}\bar{Q} \end{aligned}$$

Characteristic equation of JK flip-flop is

$$Q_{n+1} = J\bar{Q}_n + \bar{K}Q_n$$

By matching both the characteristic equation,  $J = \bar{B}$  and  $K = A$   
Hence option (a) is correct.

- A JK flip-flop with input A = K and B =  $\bar{J}$
- B JK flip-flop with input A =  $\bar{K}$  and B = J
- C SR flip-flop with input A = S and B = R

D SR flip-flop with input A = R and B = S

QUESTION ANALYTICS

Q. 26

Solution Video

Have any Doubt?



Consider a cache and memory hierarchy with the accessing times at 50 ns and 400 ns respectively. Calculate the effective memory access time with a cache hit ratio of h = 0.95 is \_\_\_\_\_ (ns).

70

Correct Option

Solution :

70

$$\begin{aligned} &= H \times T_c + (1 - H) (T_m + T_c) \\ &= 0.95 \times 50 + (1 - 0.95)450 \\ &= 47.5 + 22.5 \\ &= 70 \text{ ns} \end{aligned}$$

QUESTION ANALYTICS

Q. 27

Solution Video

Have any Doubt?



Consider system a has 39 MB data to send on a network and transmit the data in a burst with the rate of 6 Mbps. The maximum transmission rate across router in the network is 4 Mbps. System a uses leaky bucket transmission algorithm to shaping the traffic. The capacity of queue in bucket, so that no data will be discarded \_\_\_\_\_ (in MB)

13

Correct Option

Solution :

13

$$\begin{aligned} 6 \text{ Mb} &\rightarrow 1 \text{ sec} \\ \text{So, } 39 \text{ MB} &\rightarrow \frac{39 \text{ MB}}{6 \text{ Mb}} \\ &= \frac{39 \text{ M} \times 8 \text{ b}}{6 \text{ Mb}} = \frac{312 \text{ Mb}}{6 \text{ Mb}} \end{aligned}$$

Time for system to transmit data = 52 sec

$$4 \text{ Mb} \rightarrow 1 \text{ sec}$$

Actual data sent on network  $\leftarrow$  52 sec

$$\begin{aligned} &= 52 \times 4 \text{ Mb/sec} \\ &= 208 \text{ Mb} \\ &= 26 \text{ MB} \end{aligned}$$

$$\text{So bucket size} = 39 - 26 = 13 \text{ MB}$$

QUESTION ANALYTICS

Q. 28

Solution Video

Have any Doubt?



The value of  $\lim_{x \rightarrow 0} \frac{x e^x - \ln(1+x)}{x^2}$  is \_\_\_\_\_ (Upto 2 decimal places)

1.50 [1.45 - 1.55]

Correct Option

Solution :

1.50 [1.45 - 1.55]

$$\lim_{x \rightarrow 0} \frac{x e^x - \ln(1+x)}{x^2} ; \frac{0}{0} \text{ form}$$

Applying L' Hospital's rule

$$\lim_{x \rightarrow 0} \frac{e^x + x e^x - \left(\frac{1}{1+x}\right)}{2x} ; \frac{0}{0} \text{ form}$$

Applying L' Hospital's rule

$$\lim_{x \rightarrow 0} \frac{2e^x + xe^x + \frac{1}{(1+x)^2}}{2} = \frac{1+1+0+1}{2} = 1.5$$

QUESTION ANALYTICS

Q. 29

Solution Video

Have any Doubt?



Consider a binary semaphore variable S and value of S = 0, value of S after the following operation are executed on S \_\_\_\_\_.

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

0

Correct Option

**Solution :**

0

S is binary semaphore so it can take value 0 or 1

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

Number of process in suspended list

2	0	4	6	0	3	0
2P	4V	5P	2P	8V	4P	

S = 0, 1, 0, 0, 1, 0, 0

Final value of S = 0

QUESTION ANALYTICS



Q. 30

▶ Solution Video

☞ Have any Doubt ?



Consider the following infinite sets, namely C, R, O, W and N.

C: Set of all complex numbers

R: Set of all rational numbers

O: Set of all odd numbers

W: Set of all even numbers

N: Set of all natural numbers

How many of the above sets are countable \_\_\_\_\_

4

Correct Option

**Solution :**

4

The sets W, O, R and N are all countable, except for the set C. The reason is pretty straightforward - the set of real numbers is a subset of complex numbers, and since real numbers are uncountable, complex numbers are uncountable as well - since the subset itself is proven to be uncountable by Cantor's Diagonalization, the set cannot be countable. Hence 4 is the answer.

QUESTION ANALYTICS

Item 21-30 of 65 ◀ previous 1 2 3 4 5 6 7 next ▶



Kunal Jha  
Course: GATE  
Computer Science Engineering(CS)

## FULL SYLLABUS TEST-7 (ADVANCE LEVEL) GATE 2020 - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | **SOLUTION REPORT**

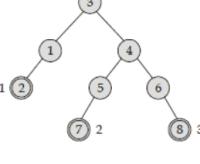
ALL(65) | CORRECT(0) | INCORRECT(0) | SKIPPED(65)

**Q. 31** Have any Doubt ?

A binary tree T is constructed with 1, 2, 3, 4, 5, 6, 7, 8. Suppose In-order and Post-order traversals produces the following result.  
In-order → 2, 1, 3, 7, 5, 4, 6, 8  
Post-order → 2, 1, 7, 5, 8, 6, 4, 3  
The number of leaves the tree T have \_\_\_\_\_.

**3** Correct Option

**Solution :**  
3  
The tree T will be look like below:



Hence total 3 leaves.

**QUESTION ANALYTICS** +

**Q. 32** Solution Video | Have any Doubt ?

Consider a relation A(P, Q, R, S, T) with functional dependencies  $F = \{P \rightarrow Q, QR \rightarrow T, ST \rightarrow P\}$ , number of additional relations required to convert it into lossless, dependency preserving 3NF decomposition \_\_\_\_\_.

**0** Correct Option

**Solution :**  
0  
Relation A(P, Q, R, S, T)  
 $F = \{P \rightarrow Q, QR \rightarrow T, ST \rightarrow P\}$ ,  
 $(RST)^+ = (PQRST)$   
 $(PRS)^+ = (PQRST)$   
 $(QRS)^+ = (PQRST)$   
Total 3 candidate keys (RST, PRS, QRS) all P, Q, R, S, T is prime attribute so relation A is already in 3NF.  
No additional table is required.

**QUESTION ANALYTICS** +

**Q. 33** Have any Doubt ?

Consider the following SDT:  
 $A \rightarrow A + B$        $[A.val = A_1.val + B.val]$   
 $A \rightarrow A \times B$        $[A.val = A_1.val \times B.val]$   
 $A \rightarrow A - B$        $[A.val = A_1.val - B.val]$   
 $A \rightarrow id$        $[A.val = id.num]$

I. The above SDT is S attributed.  
II. The above SDT is L attribute but not S attribute.  
III. The above SDT is only S attributed.  
The number of correct statement(s) \_\_\_\_\_.

**1** Correct Option

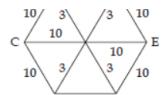
**Solution :**  
1  
Given SDT has synthesized attribute notation and every translation is at the end of production so it is S attributed.  
Every S-attributed is also L attributed.

**QUESTION ANALYTICS** +

**Q. 34** Solution Video | Have any Doubt ?

Consider the following graph:





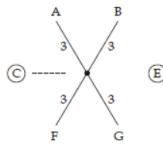
The number of distinct minimum spanning tree for weighted graph are \_\_\_\_\_.

9

Correct Option

Solution :

9



For C there is 3 choices.

For E there is also 3 choices

Total number of possible MST =  $3 \times 3 = 9$

QUESTION ANALYTICS

+

Q. 35

Have any Doubt ?

□

Consider the following code:

```
int x[ ] = {1, 4, 8, 5, 1, 4};
int *ptr, y;
ptr = x + 4;
y = ptr - x;
```

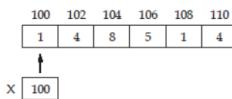
What does y in the sample code above equal? \_\_\_\_\_.

4

Correct Option

Solution :

4



- $\text{ptr} = x + 4$  (skip 4 elements)  
meaning,  $\text{ptr} = x + 4$  (size of (integer))  
 $\text{ptr} = 100 + 4 \times 2 = 108$
- $y = \text{ptr} - x$   
$$y = \frac{108 - 100}{2(\text{Size of integer})}$$
$$y = 4$$

QUESTION ANALYTICS

+

Q. 36

Solution Video

Have any Doubt ?

□

Consider an undirected graph  $G(V, E)$  which is represented through adjacency list, for any two set of vertices let  $G_1, G_2$  distance ( $G_1, G_2$ ) be defined as the minimum of length of shortest distance between a vertex in  $G_1$  and  $G_2$ , if  $G_1 \cap G_2 \neq \emptyset$ , then assume distance ( $G_1, G_2$ ) = 0, what is the optimal time complexity to compute distance ( $G_1, G_2$ )?

A O(VE)

Correct Option

B O(V + E)

Solution :

(b)

To compute the distance ( $G_1, G_2$ ), take 2 new vertices  $x$  and  $y$ , connect  $x$  to all vertices in  $G_1$  and  $y$  to all vertices in  $G_2$ , then perform a BFS from  $x$  to  $y$ .

The length of the path obtained minus 2 (one edge from  $x$  and one from  $y$ ) will give the result.

Time complexity of BFS is  $O(V + E)$ .

C O( $V^2$ )

D O( $EV^2$ )

QUESTION ANALYTICS

+

Q. 37

Have any Doubt ?

□

Consider the following statements:

- I. HTTP resources are identified and located on the network by uniform resource locators.
- II. FTP may run in active or passive mode, which determines how the data connection is established.

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

A I only

B II only

C Both I and II

Correct Option

Solution :

- (c)
  - I. HTTP resources are identified and located on the network by uniform resource location.
  - II. 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, if it is listening.

D Neither I nor II

 QUESTION ANALYTICS



Q. 38

 Solution Video

 Have any Doubt ?



Let S be a set containing all binary strings of length 6. Strings are drawn from this set one by one without replacement. How many draws are necessary to guarantee that we get at least one string with odd number of zeroes?

A 31

B 36

C 33

Correct Option

Solution :

- (c)

We know that the number of 6 bit binary strings are equal to  $2^6 = 64$ , out of which half of the strings will have an even number of zeroes, and the remaining half will have an odd number of zeroes. Now we need to imagine the worst case scenario. While picking the strings, we may end up drawing 32 strings which contain an even number of zeroes in any particular order. But now that these strings are exhausted, we can guarantee that the next time we pick (33<sup>rd</sup> draw) will surely result in a string containing an odd number of zeroes. So 33 draws are required to guarantee this. Hence option (c) is the answer.

D 63

 QUESTION ANALYTICS



Q. 39

 Solution Video

 Have any Doubt ?



Consider two process  $P_i$  and  $P_j$  with the following synchronization mechanism:

Process $P_i$	Process $P_j$
while (1)	while (1)
{	{
<i>i</i> = false;	<i>j</i> = false;
<i>j</i> = true;	<i>i</i> = true;
while ( <i>i</i> == true);	while ( <i>j</i> == true);
critical section	critical section
<i>j</i> = false;	<i>i</i> = false
}	}

*i* and *j* are two shared boolean variable between process  $P_i$  and  $P_j$ . Which of the following is true about the above synchronization mechanism when both process executed concurrently?

A It satisfy mutual exclusion and prevent deadlock.

B It satisfy mutual exclusion but does not prevent deadlock.

C It does not satisfy mutual exclusion but prevent deadlock.

D None of these

Correct Option

Solution :

- (d)

When  $P_i$  executed it make *i* = false and enter into critical section, when  $P_j$  executed it make *j* = false and enter into critical section at the same time. So mutual exclusion does not satisfy.

When both process execute concurrently  $P_i$  make *j* = true and  $P_j$  makes *i* = true and no process can enter into critical section so it does not prevent deadlock.

 QUESTION ANALYTICS



Q. 40

 Solution Video

 Have any Doubt ?



Consider a file of 8192 records. Each record is 16 bytes long and its key field is of size 6 bytes. The file is ordered on a key field, and the file organization is unspanned. The file is stored in a file system with block size 512 bytes, and the size of a block pointer is 10 bytes. If the primary index is built on the key field of the file, and a multilevel index scheme is used to store the primary index, the number of first-level and second-level blocks in the multilevel index are respectively

**Solution :**

(a)

Content of index &lt;key, EP&gt; = 6 + 10 = 16

$$\text{Block factor of database} = \frac{512}{16} = 32$$

$$\text{Number of block in database} = \frac{8192}{32} = 256$$

In first level entry for each record,

$$\text{Number of blocks in first level} = \frac{\text{Number of Database Block}}{\text{Entry size of 1st level}} = \left\lceil \frac{256}{32} \right\rceil = 8$$

In second level

$$\text{Number of blocks in second level} = \frac{\text{Number of 1st level Block}}{\text{Entry size of 2nd level}} = \left\lceil \frac{8}{32} \right\rceil = 1$$

**B** 16 and 1**C** 8 and 2**D** None of these QUESTION ANALYTICS

+



Kunal Jha

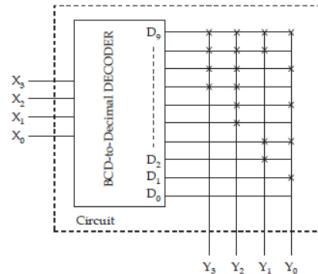
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## FULL SYLLABUS TEST-7 (ADVANCE LEVEL) GATE 2020 - REPORTS

[OVERALL ANALYSIS](#)
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[ALL\(65\)](#)
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[INCORRECT\(0\)](#)
[SKIPPED\(65\)](#)
**Q. 41**
[▶ Solution Video](#)
[Have any Doubt ?](#)


Consider the following digital circuit:



The above circuit represents some functionality i.e. (X) marks at the junction represents logic 1. Assume if the (X<sub>3</sub>, X<sub>2</sub>, X<sub>1</sub>, X<sub>0</sub>) in the circuit are (8, 4, 2, 1) BCD numbers, then the outputs Y<sub>3</sub>, Y<sub>2</sub>, Y<sub>1</sub>, Y<sub>0</sub> are

 A Excess-3 code numbers

 B Gray code numbers

 C 2 – 4 – 2 – 1 BCD numbers

Correct Option

**Solution :**  
 (c)

8	4	2	1	X <sub>3</sub>	X <sub>2</sub>	X <sub>1</sub>	X <sub>0</sub>	2	4	2	1	Y <sub>3</sub>	Y <sub>2</sub>	Y <sub>1</sub>	Y <sub>0</sub>
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	1	0	1	0
0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0
0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	1
0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0
0	1	0	1	0	1	0	0	0	1	1	0	0	1	0	1
0	1	1	0	0	0	1	0	1	1	0	0	0	0	1	0
0	1	1	1	1	0	1	1	1	1	0	0	1	1	0	1
1	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0
1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1

Hence the circuit is 8 – 4 – 2 – 1 BCD to 2 – 4 – 2 – 1 BCD.

 D None of these

QUESTION ANALYTICS


**Q. 42**
[▶ Solution Video](#)
[Have any Doubt ?](#)


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

**List-I**

- A. Source quench
- B. Parameter problem
- C. Redirect
- D. Destination unreachable

**List-II**

- 1. Choke packet
- 2. Undelivered packet
- 3. Teach a router about geography
- 4. Invalid header

Codes:

A	B	C	D
(a) 3 2 1 4			
(b) 1 4 3 2			
(c) 1 4 2 3			
(d) 4 2 1 3			

 a

 b

Correct Option

**Solution :**

- (b) Source quench → Choke packet
- Parameter problem → Invalid header field
- Redirect → Teach a router about geography
- Destination unreachable → Undelivered packet

 c

 d

QUESTION ANALYTICS



Q. 43

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider the following regarding a language L over an arbitrary alphabet.

I.  $\overline{L^*} = (\overline{L})^*$

II.  $\overline{L^*} = (\overline{L})^* - \{\epsilon\}$

Now we're given the following statements:

$S_1$  : There exists a language L satisfying I.

$S_2$  : There exists a language L satisfying II.

$S_3$  : Every language satisfying II.

Which of the above statements are true?

A  $S_1$  and  $S_3$  only

B  $S_2$  only

Correct Option

**Solution :**

(b)

I is never satisfiable. Because the LHS will never have  $\epsilon$ , and RHS will contain  $\epsilon$  (always).

So  $S_1$  is false.

For II, let  $L = \Sigma^*$ . Then we need to see if

$$(\Sigma^*)^* = \Sigma^* - \{\epsilon\}$$

LHS:  $(\Sigma^*)^*$

$$= (\Sigma^*)^* \quad [\text{as } (\Sigma^*)^* = \Sigma^*]$$

$$= \emptyset$$

Now, RHS:  $\Sigma^* - \{\epsilon\}$

$$= \emptyset - \{\epsilon\} = \emptyset$$

Hence, LHS = RHS

So we've given as existence proof and hence  $S_2$  is true.

C  $S_1, S_2$  and  $S_3$

D  $S_1$  and  $S_2$  only

QUESTION ANALYTICS



Q. 44

[▶ Solution Video](#)[Have any Doubt ?](#)

Consider an array A[] which has n element, what is the time complexity of most efficient algorithm to compute the maximum sum subarray of A if the array contain only natural numbers?

A  $O(n)$

B  $O(n^2)$

C  $O(1)$

Correct Option

**Solution :**

(c)

It is given that array A contain only natural number so A does not have any negative number so whole array A is maximum sum subarray.

Time complexity will be  $O(1)$ .

D  $O(n \log n)$

QUESTION ANALYTICS



Q. 45

[Have any Doubt ?](#)

Consider the given C program. There is a problem with this program:

```
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
int main (int argc, char* argv [ ])
{
    char process[5];
    if (argc < 2)
    {
        printf("Not to be executed....\n");
        printf("Syntax: %s <characters>\n", argv [0]);
        exit (0);
    }
    strcpy (process, argv[1]);
    printf("The Process is = %s\n", process);
    return (0);
}
```

What kind of problem is it?

A Integer overflow problem

**B** Buffer overflow problem

Correct Option

**Solution :**

(b) The program having "Buffer overflow" problem.

Assume argv[1] = "Helloworld".

Here in this program (Strcpy) will try to copy the user command input in the array process which is of size of 5 and "Helloworld" is of size 10 which is more than the defined size of process. So the data will get written past the right boundary of array process.  
Such type of scenario consider in "Buffer overflow" problem.

**C** Heap overflow problem**D** No problem

## QUESTION ANALYTICS

+

**Q. 46**

Solution Video

Have any Doubt ?

Q

Consider the relation  $R(A, B, C, D)$ . Which of the following relational algebra expression returns the lowest value of  $A$ ? ( $R_1$  and  $R_2$  are just renames of  $R$ )

**A**  $\pi_{R_1 A}(R_1 \bowtie_{R_1 A < R_2 A} R_2)$ **B**  $\pi_A(R) - \pi_{R_1 A}(R_1 \bowtie_{R_1 A > R_2 A} R_2)$ 

Correct Option

**Solution :**

(b)

$$S = \pi_{R_1 A}(R_1 \bowtie_{R_1 A > R_2 A} R_2)$$

Find all values of  $A$  except the lowest. $\pi_A(R) - S$  finds the lowest value of  $A$ .**C**  $\pi_A(R) - \pi_{R_1 A}(R_1 \bowtie_{R_1 A < R_2 A} R_2)$ **D** None of these

## QUESTION ANALYTICS

+

**Q. 47**

Solution Video

Have any Doubt ?

Q

Consider the following two designs for a little cache.

Design #1 is a direct-mapped cache of 8 1-word cache lines. The miss penalty is 8 clock cycles. Design #2 can store the same total number of items as Design #1, but it is a two-way associative cache of 1-word cache lines. Least-recently-used is utilized to determine which items should be removed from the cache. The miss penalty is 10 clock cycles. Suppose that the following eight memory references arrive. Memory References: 0, 3, 14, 11, 4, 11, 8, 0 How much time will these designs spend on cache miss penalties, assuming that the caches start empty?

**A** Design #1 spends 56 cycles and Design #2 spends 60 cycles**B** Design #1 spends 56 cycles and Design #2 spends 70 cycles

Correct Option

**Solution :**

(b)

Consider Design #1 first. The memory references will map to the following respective cache lines:

0, 3, 6, 3, 4, 3, 0, and 0. After each memory reference, the cache will look as follows:

(where \* indicates empty), for a total of 7 misses (56 cycles):

After reference to 0...0 \*\*\*\* (this caused a miss)

After reference to 3...0 \*\* 3 \*\*\* (this caused a miss)

After reference to 14...0 \*\* 3 \*\* 14 \* (this caused a miss)

After reference to 11...0 \*\* 11 \*\* 14 \* (this caused a miss)

After reference to 4...0 \*\* 11 4 \* 14 \* (this caused a miss)

After reference to 11...0 \*\* 11 4 \* 14 \*

After reference to 8...8 \*\* 11 4 \* 14 \* (this caused a miss)

After reference to 0...0 \*\* 11 4 \* 14 \* (this caused a miss)

Now, Design #1 can store 8 items, and Design #2 can store the same number of items. However, in Design #2, these are grouped in pairs, so the conversion from memory addresses to cache locations is modulo 4 rather than modulo 8. Hence, the memory references map to the following cache lines: 0, 3, 2, 3, 0, 3, 0, and 0. So after each memory reference, the cache will look as follows (where \* indicates empty, and hyphens join cache lines in the same associative block), for a total of 7 misses (70 cycles):

After reference to 0...0-\* \*-\* \*-\* \*-\* (this caused a miss)

After reference to 3...0-\* \*-\* \*-\* 3-\* (this caused a miss)

After reference to 14...0-\* \*-\* 14-\* 3-\* (this caused a miss)

After reference to 11...0-\* \*-\* 14-\* 3-11 (this caused a miss)

After reference to 4...0-\* \*-\* 14-\* 3-11 (this caused a miss)

After reference to 11...0-\* \*-\* 14-\* 3-11

After reference to 8...8-\* \*-\* 14-\* 3-11 (this caused a miss)

After reference to 0...8-\* \*-\* 14-\* 3-11 (this caused a miss)

**C** Design #1 spends 48 cycles and Design #2 spends 70 cycles**D** Design #1 spends 64 cycles and Design #2 spends 60 cycles

Q. 48

Have any Doubt ?

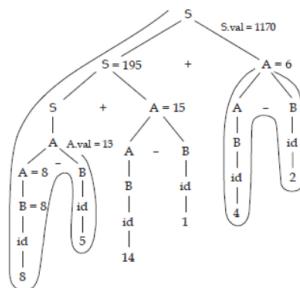


Consider the following SDT:

$S \rightarrow S + A$	$\{S.val = \underline{a}\}$
$S \rightarrow A$	$\{S.val = A.val\}$
$A \rightarrow A - B$	$\{A.val = \underline{b}\}$
$A \rightarrow B$	$\{A.val = B.val\}$
$B \rightarrow id$	$\{B.val = id.num\}$

What is the missing expression at a and b if the string  $8 - 5 + 14 - 1 + 4 - 2$  produce 1170 instead of 18? A  $a = S_1.val - A.val, b = A_1.val + B.val$  B  $a = S_1.val + A.val, b = A_1.val \times B.val$  C  $a = S_1.val \times A.val, b = A_1.val + B.val$ 

Correct Option

Solution :  
(c) D None of these

Q. 49

Solution Video

Have any Doubt ?



A random variable X has following probability distributions:

X	0	1	2	3	4	5	6	7
$P(X)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

What is the probability  $P(0 < x < 3)$ ? A 0.2 B 0.3

Correct Option

Solution :  
(b)

We know that, the sum of a probability distribution of random variable is one.

$$\text{i.e. } \sum P(X) = 1$$

$$0 + k + 2k + 2k + 3k + k^2 + 2k^2 + 7k^2 + k = 1$$

$$10k^2 + 9k - 1 = 0$$

$$10k^2 + 10k - k - 1 = 0$$

$$(10k - 1)(k + 1) = 0$$

$$k = \frac{1}{10} \text{ or } -1$$

But  $k = -1$  is rejected because probability cannot be negative.

$$\therefore k = \frac{1}{10}$$

$$P(0 < X < 3) = P(X = 1) + P(X = 2)$$

$$= k + 2k = 3k$$

$$= \frac{3}{10} = 0.3$$

 C 0.4 D 0.5

Q. 50

Have any Doubt ?



Assume in a single linked list pointer to head is unknown and a randomly selected pointer to a node N is given. Is it possible to delete the node N from given linked list with

maintaining linked list property?

- A Possible only if it is last node.
- B Possible only if is not last node and pointer of just before node N is known.
- C By doing following operations it can be done by following steps: (i) Copy the data of next of N to N (ii) Delete next of N
- D None of these

Correct Option

Solution :

- (d)
- The mentioned operations can be done only if
- (i) If it is not last node.
  - (ii) Struct \* temp = N → next;  
N → data = temp → data;  
N → next = temp → next;  
free (temp);  
This is exactly as mentioned in option (c).
- None of these options are correct because both rules are not present in any option.

 QUESTION ANALYTICS



Item 41-50 of 65 « previous 1 2 3 4 5 6 7 next »



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**Q. 51**
[▶ Solution Video](#)
[Have any Doubt ?](#)


Consider the following languages over  $\Sigma = \{0, 1\}$   
 $L_1 : \{w_1 w_2 \mid |w_1| \neq |w_2|\}$   
 $L_2 : \{w_1 w_2 w_3 \mid |w_1| = |w_2| \text{ and } |w_2| = |w_3|\}$   
 $L_3 : \{w_1 \neq w_2 \mid w_2 = w_1^R\}$

How many of the above languages are regular \_\_\_\_\_.

 A 0

 B 1

 C 2

Correct Option

**Solution :**

(c)  
 Only  $L_1$  and  $L_2$  are regular.

$L_1$  will contain all the odd length strings, for which we can easily design a DFA. So  $L_1$  is regular.  
 Similarly,

$$L_2 = \{w \mid |w| \equiv 0 \pmod{3}\}$$

That is,  $L_2$  contains strings whose length is divisible by 3, which is also regular. But  $L_3$  is a well known 'Hash palindrome' which is DCFL but not regular, so 2 is the correct answer.

 D 3

[QUESTION ANALYTICS](#)

**Q. 52**
[Have any Doubt ?](#)


Assume that we have the following values in the given memory locations:

Location	Value
1000	1300
1100	1200
1200	800
1300	1200

Also assume that the index register R1 stores 200 and is always implicitly used for the indexed addressing mode. What datum is loaded into the accumulator if the instruction is LOAD 1000 for Immediate addressing modes, Direct addressing modes, Indirect addressing modes, Base (Indexed) addressing modes respectively.

 A 1300, 1200, 800, 1100

 B 1000, 1200, 800, 1300

 C 1000, 1100, 1200, 800

 D 1000, 1300, 1230, 800

Correct Option

**Solution :**

- (d)
- |              |                   |
|--------------|-------------------|
| a. Immediate | b. Direct         |
| 1000         | 1300              |
| c. Indirect  | d. Base (Indexed) |
| 1230         | 800               |

[QUESTION ANALYTICS](#)

**Q. 53**
[Have any Doubt ?](#)


An organization is granted the block 190.76.0.0/16. The administrator wants to create 1024 subnets using 10 bits. The first and last addresses in subnet 1024<sup>th</sup> respectively are

 A 190.76.255.0/26 and 190.76.255.255/26

 B 190.76.255.1/16 and 190.76.255.255/16

 C 190.76.255.192/26 and 190.76.255.255/26

Correct Option

**Solution :**

Number of subnets = 1024  
 Bits required for subnet = 10  
 Network mask = 255.255.255.192  
 Number of hosts/subnet =  $2^6 - 2$   
 Ranges are:  
 190.76.0.0/26 to 190.76.0.63/26 ----- 1<sup>st</sup> subnet  
 190.76.0.64/26 to 190.76.0.127/26 ----- 2<sup>nd</sup> subnet  
 190.76.0.128/26 to 190.76.0.191/26 ----- 3<sup>rd</sup> subnet  
 190.76.0.192/26 to 190.76.0.255/26 ----- 4<sup>th</sup> subnet  
 190.76.1.0/26 to 190.76.1.63/26 ----- 5<sup>th</sup> subnet  
 :  
 190.76.255.128/26 to 190.76.255.191/26 ----- 1023<sup>th</sup> subnet  
 190.76.255.192/26 to 190.76.255.255/26 ----- 1024<sup>th</sup> subnet

D 190.76.255.192/16 and 190.76.255.255/16

QUESTION ANALYTICS

Q. 54

Have any Doubt?



Consider an undirected random graph of eight vertices. The probability that there is an edge between a pair of vertices is  $\frac{1}{2}$ . Then the expected number of unordered cycles of length 3 is equal to \_\_\_\_\_.

7

Correct Option

Solution :  
7

$$\text{Probability that a particular cycle of length 3 exists} = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$$

We'll make use of a random variable  $X_i$  which equals 0 if cycle  $i$  is absent and 1 if cycle  $i$  is present.

$$\text{Hence } E(X_i) = 0.P(X_i') + 1.P(X_i) = P(X_i) = \frac{1}{8}$$

Now the number of unordered cycles =  $X_1 + X_2 + \dots + X_{56}$  (Since there are  $8c3$  i.e. 56 cycles possible)

Therefore, the expected number of unordered cycles =  $E(X_1 + X_2 + \dots + X_{56})$

By linearity of expectation we can write,

$$E(X_1) + E(X_2) + E(X_3) + \dots + E(X_{56}) = \frac{1}{8} + \frac{1}{8} + \dots + \frac{1}{8} \text{ (56 times)} = \frac{56}{8} = 7$$

Therefore the required answer will be equal to 7.

QUESTION ANALYTICS

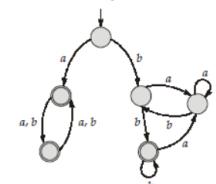


Q. 55

Have any Doubt?



Consider the following DFA 'M', over  $\Sigma = \{a, b\}$ .



We are given the following strings to be executed on M. How many of the given strings will be accepted by M \_\_\_\_\_.

- I.  $a^5 b^{27}$
- II.  $b^5 a^{27}$
- III.  $b^{17} a b^{34}$
- IV.  $b^{24} (ab)^{16} b^8$

3

Correct Option

Solution :  
3

The number M accepts strings which "either start with a or end with bb". Since I starts with a, I is accepted. Since II neither starts with a, nor ends with bb, II is rejected. Coming to III, III does end with bb (i.e., write III as  $b^{17} a b^{32} \cdot bb$ ) and similarly IV also ends with bb. Hence both are accepted. So except II, all the other 3 are accepted.

So 3 is the answer.

QUESTION ANALYTICS



Q. 56

Have any Doubt?



In CSMA/CD, 200m is length of cable, then in order to maintain same frame size in switched ethernet i.e. 100baseT then the length of the cable required is/are \_\_\_\_\_ (in meter).

20

Correct Option

**Solution :**

(20)

$$\frac{200}{10} = L$$

L = 20 meter

QUESTION ANALYTICS

Q. 57

Have any Doubt ?



Consider the following set of process:

Process	Arrival Time	CPU Burst Time	I/O Burst Time	CPU Burst Time
P <sub>0</sub>	0	3	2	2
P <sub>1</sub>	0	2	4	1
P <sub>2</sub>	2	1	3	4
P <sub>3</sub>	3	2	2	2

Operating system uses preemptive shortest remaining time first algorithm, average waiting time \_\_\_\_\_ (ms). (Upto 1 decimal places) [Ties are broken with lowest process ID number] Note: (i) Consider only CPU burst time as burst time.

(ii) Process first spends time in CPU followed by I/O and followed by CPU time.

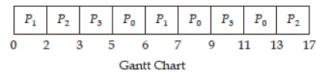
(iii) I/O of the process can be done parallelly.

6.5 [6.5 - 6.5]

Correct Option

**Solution :**

6.5 [6.5 - 6.5]



Waiting time = Turn around time - Burst time

Process	Waiting Time
P <sub>0</sub>	8
P <sub>1</sub>	4
P <sub>2</sub>	10
P <sub>3</sub>	4

$$\text{Average waiting time} = \frac{8+4+10+4}{4} = \frac{26}{4} = 6.5 \text{ ms}$$

QUESTION ANALYTICS

Q. 58

Have any Doubt ?



Consider you start in city 's' and need to drive to city 't' and you will follow the road via cities (in sequence) a<sub>1</sub>, a<sub>2</sub>, a<sub>3</sub>..., an. Given all the distances between consecutive cities and prices of gas at each station in the following table:

City	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	a <sub>6</sub>	a <sub>7</sub>	a <sub>8</sub>	a <sub>9</sub>	t
Price of gas (per mile)	3	5	2	1	5	4	9	9	4	1
Distance (from previous station)	7	10	3	3	16	9	18	17	5	4

If car's tank can only take enough gas to travel 20 miles. Your goal to make the trip spending as little as possible on gas. The optimal cost for tour is \_\_\_\_\_. (Assume initially tank is full)

327

Correct Option

**Solution :**

327

Step 1: Initially car tank is full. So from s to a<sub>3</sub> can be travelled without any cost.

Step 2: Since at city a<sub>4</sub> cost is minimum, fill the tank at a<sub>4</sub> and buy gas for 20 miles (in 20).

Step 3: At city a<sub>5</sub>, cost is more than city a<sub>6</sub>, so at a<sub>5</sub>, only buy gas for 5 miles to reach city a<sub>6</sub> (in 25).

Step 4: Drive to city a<sub>6</sub> and buy gas for 20 miles (80).

Step 5: Drive to city a<sub>7</sub> and buy gas for 15 miles (135).

Step 6: Drive to city 8 and buy gas for 5 miles (45).

Step 7: Drive to city 9 and by gas for 4 miles (16).

$$\begin{aligned}\text{Total cost} &= 6 + 20 + 25 + 80 + 135 + 45 + 16 \\ &= 327\end{aligned}$$

QUESTION ANALYTICS

Q. 59

Have any Doubt ?



Consider a unix inode which maintain 30 direct pointer, 2 single indirect, 1 double indirect and 1 triple indirect pointers, disk block size is 8 KB and disk block address 128 bit, maximum possible file size is \_\_\_\_\_ (GB).

1024

Correct Option

**Solution :**

1024

$$\text{Block size} = 8 \text{ KB} = 2^{13} \text{ B}$$

$$\text{Number of disk block pointers in one block} = \frac{2^{13} \text{ B}}{16 \text{ B}} = 2^9$$

$$\begin{aligned}\text{Maximum possible file size} &= (30 + 2 \times 2^7 + 1 \times 2^7 \times 2^7 + 1 \times 2^7 \times 2^7 \times 2^7) \times 8 \text{ KB} \\ &= 2^{27} \times 8 \text{ KB} \\ &= 2^{30} \text{ KB} = 2^{10} \text{ GB} = 1024 \text{ GB}\end{aligned}$$

Q. 60

 Solution Video

 Have any Doubt ?



Three persons A, B and C apply for a job of manager in a private company. Chances of their selection (A, B and C) are in the ratio 1 : 2 : 4. The probabilities that A, B and C can introduce changes to improve profits of the company are 0.8, 0.5 and 0.3, respectively. If the change does not take place. The probability that it is due to the appointment of C is \_\_\_\_\_. (Upto 2 decimal places)

 0.70 [0.68 - 0.72]

Correct Option

Solution :

0.70 [0.68 - 0.72]

Let us define the following events.

A = selecting person A

B = selecting person B

C = selecting person C

$$P(A) = \frac{1}{1+2+4} = \frac{1}{7}, P(B) = \frac{2}{1+2+4} = \frac{2}{7}$$

$$\text{and } P(C) = \frac{4}{1+2+4} = \frac{4}{7}$$

Let E = Event to introduce the changes in their profit.

$$\text{Also, given } P\left(\frac{E}{A}\right) = 0.8, P\left(\frac{E}{B}\right) = 0.5 \text{ and } P\left(\frac{E}{C}\right) = 0.3$$

$$P\left(\frac{\bar{E}}{A}\right) = 1 - 0.8 = 0.2, P\left(\frac{\bar{E}}{B}\right) = 1 - 0.5 = 0.5$$

$$\text{and } P\left(\frac{\bar{E}}{C}\right) = 1 - 0.3 = 0.7.$$

The probability that change does not take place by the appointment of C.

$$\begin{aligned}P\left(\frac{C}{\bar{E}}\right) &= \frac{P(C).P\left(\frac{\bar{E}}{C}\right)}{P(A) \times P\left(\frac{\bar{E}}{A}\right) + P(B) \times P\left(\frac{\bar{E}}{B}\right) + P(C) \times P\left(\frac{\bar{E}}{C}\right)} \\ &= \frac{\frac{4}{7} \times 0.7}{\frac{1}{7} \times 0.2 + \frac{2}{7} \times 0.5 + \frac{4}{7} \times 0.7} = \frac{2.8}{0.2 + 1.0 + 2.8} = 0.7\end{aligned}$$



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**Q. 61**
[Have any Doubt ?](#)


The number of ways in which the numbers 1, 2, 3, 4, 5 can be inserted into binary heap. Such that resulted binary heap is max heap \_\_\_\_\_.

**8**
[Correct Option](#)
**Solution :**
**8**

Number max heap with n node is given by

$$f(0) = 1$$

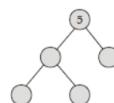
$$f(1) = 1$$

$$f(n) = \binom{n-1}{L} f(L) f(R)$$

where

 $L = \text{Number of left subtree nodes}$ 
 $R = \text{Number right subtree nodes.}$ 

Max heap structure like


 So,  $L = 3, R = 1$ 

$$f(2) = \binom{1}{1} f(1) f(0) = 1$$

$$f(3) = \binom{2}{1} f(1) f(1) = 2$$

$$f(4) = \binom{3}{2} f(2) f(1) = 3$$

$$f(5) = \binom{4}{3} f(3) f(1) = 4 \times 2 = 8$$

[QUESTION ANALYTICS](#)

**Q. 62**
[Solution Video](#)
[Have any Doubt ?](#)


Consider the following relation:

Eid	ename	Salary
2	P	25000
8	Q	30000
23	S	32000
15	T	31000
17	P	25000
25	W	30000
35	C	31000
48	D	32000
58	S	31000

The number of tuples returned by the following SQL query \_\_\_\_\_.

Select Eid FROM Employee E where  
 E.salary = (Select MAX (E<sub>1</sub>.salary) FROM  
 Employee E<sub>1</sub> where E<sub>1</sub>.salary ≠ (Select  
 MAX (E<sub>2</sub>.salary) FROM Employee E<sub>2</sub>))

**3**
[Correct Option](#)
**Solution :**
**3**

Given SQL query returned the Eid of employee who has the second highest salary.

Eid
15
35
58

Total 3 tuples will be returned.

[QUESTION ANALYTICS](#)

**Q. 63**
[Solution Video](#)
[Have any Doubt ?](#)


Recall that an implicants is a product term in the sum of products representation of a Boolean function. A prime implicants is an implicants of minimal size (i.e. an implicants with the fewest literals).

 I.  $a'cd'$ 

 II.  $abcd$ 

 III.  $a'b'c$ 

 IV.  $a'b'c'd'$

The number of above are NOT prime implicants for the function  $F(a, b, c, d) = abc' + abc + a'bc + ab'd'$  is \_\_\_\_\_.

3

Correct Option

Solution :

3

		cd	00	01	11	10
		ab	00	01	11	10
00	01		1			
				1	1	
11	10			1	1	1
			1	1		

Prime implicants are =  $bc$ ,  $a'cd'$ ,  $ab'c'$ ,  $b'c'd'$ ,  $a'b'd'$

Given II, III and IV are not prime implicants.

Hence 3 is answer.

QUESTION ANALYTICS



Q. 64

Have any Doubt ?



Given the 3-address code for a basic block:

Num	Instruction	Meaning
1	Ld $a, T_1$	$T_1 \leftarrow a$
2	Ld $b, T_2$	$T_2 \leftarrow b$
3	Ld $c, T_3$	$T_3 \leftarrow c$
4	Ld $d, T_4$	$T_4 \leftarrow d$
5	Add $T_1, T_2, T_5$	$T_5 \leftarrow T_1 + T_2$
6	Add $T_3, T_4, T_6$	$T_6 \leftarrow T_3 + T_4$
7	Add $T_5, T_6, T_7$	$T_7 \leftarrow T_5 + T_6$
8	ST $T_7, a$	$a \leftarrow T_7$

How many registers are needed to allocate this basic block with no spills \_\_\_\_\_.

4

Correct Option

Solution :

4

$$\begin{aligned} R_1 &\leftarrow a \\ R_2 &\leftarrow b \\ R_3 &\leftarrow c \\ R_4 &\leftarrow d \\ R_2 &\leftarrow R_1 + R_2 \\ R_3 &\leftarrow R_3 + R_2 \\ R_4 &\leftarrow R_3 + R_4 \\ a &\leftarrow R_4 \end{aligned}$$

So, 4 registers are needed

QUESTION ANALYTICS



Q. 65

Solution Video

Have any Doubt ?



Consider an ordinary processor that works 2 GHz frequency and uses 2 cycles for ALU operations, 4 cycles for branch instructions and 3 cycles for memory operations and relative frequencies of these operations are 25%, 40% and 35% respectively. Assume there is no overhead other than cycle time. The speedup we gain if we replace this with pipeline is \_\_\_\_\_. (Upto 2 decimal places)

3.15 (3.10 - 3.20)

Correct Option

Solution :

3.15 (3.10 - 3.20)

- Here assume ordinary processor as non-pipelined system. So,

Number of cycle required for a instruction =  $2 \times 0.25 + 4 \times 0.4 + 3 \times 0.35 = 3.15$  cycles

$$\text{Execution time} = 3.15 \times \frac{1}{2} \text{ ns} = 1.575 \text{ ns}$$

- Now here they have not mentioned particularly about number of the instruction. Therefore we will assume 1 cycle for each instruction in pipelined system. So,

$$\text{Execution time} = 1 \times 0.5 \text{ ns} = 0.5 \text{ ns}$$

$$\text{So, } \text{Speedup} = \frac{1.575}{0.5} = 3.15$$

QUESTION ANALYTICS

