



Kunal Jha

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Computer Science Engineering(CS)

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MY TEST

BOOKMARKS

MY PROFILE

REPORTS

BUY PACKAGE

NEWS

TEST SCHEDULE

## GATE MOCK TEST 4 (GATE - 2021) - REPORTS

OVERALL ANALYSIS

COMPARISON REPORT

SOLUTION REPORT

ALL(65)

CORRECT(0)

INCORRECT(0)

SKIPPED(65)

Q. 1

Solution Video

Have any Doubt ?

Select the word that is most SIMILAR in meaning to the bold word in capital letters.  
VAPID

(A) Virtuous

(B) Priceless

(C) Dull

Correct Option

(D) Vital

## QUESTION ANALYTICS



Q. 2

Solution Video

Have any Doubt ?

Select the word that is FARTHEST in meaning to the bold word in capital letters.  
COVERT

(A) Clandestine

(B) Open

Correct Option

Solution :  
(b)

(C) Virtuous

(D) Wide

## QUESTION ANALYTICS



Q. 3

Solution Video

Have any Doubt ?



In the final analysis, the wealth of a country is based upon its power to develop and to effectively utilize the innate capacities of its people. It takes skilled human agent to discover and exploit natural resources, to mobilize capital, to develop technology, to produce goods and to carry out trade. Indeed, if a country is unable to develop its human resource, it cannot build anything else whether it be a modern political system, a sense of national unity, or a prosperous economy. This paragraph best supports the statement that

(A) The wealth of a country resides in several types of resources.

(B) Natural resources play a vital role in human development.

Correct Option

(C) Human resources constitute the ultimate basis for the wealth of nations.

Solution :  
(c)

(D) Capital and natural resources are active factors of production.

## QUESTION ANALYTICS



Q. 4

Solution Video

Have any Doubt ?



The cost of the pipe varies directly with the square of its length. Pipe is broken into 3 parts whose lengths are in ratio 4 : 3 : 5. If pipe had been broken into three equal parts by length then there would have been a further loss of 3200. What is the actual cost of the original (unbroken) pipe?

(A) ₹ 115200

(B) ₹ 230400

Correct Option

**Solution :**  
(b)

$$\begin{aligned}L_1 : L_2 : L_3 &= 4 : 3 : 5 \\ \text{Cost} &= (4x)^2 + (3x)^2 + (5x)^2 = 50x^2 \\ \text{Again, } L_1 : L_2 : L_3 &= 4 : 4 : 4 \text{ (when broken into equal part)} \\ \text{Cost} &= (4x)^2 + (4x)^2 + (4x)^2 = 48x^2 \\ \text{Loss} &= 50x^2 - 48x^2 = 3200 \\ 2x^2 &= 3200 \\ x &= 40 \\ \text{Actual cost of unbroken pipe} &= [(4+3+5)x]^2 \\ &= (12x)^2 \\ &= (12 \times 40)^2 \\ &= ₹ 230400\end{aligned}$$

**C** ₹ 460800

**D** None of these

QUESTION ANALYTICS

+

Q. 5

Solution Video

Have any Doubt?

Q

If  $\left(x^2 + \frac{1}{x^2}\right) = 194$ , then what is the value of  $\left(x^3 + \frac{1}{x^3}\right)$ ? (Given  $x > 0$ )

**2702**

Correct Option

**Solution :**  
2702

$$\begin{aligned}\left(x^2 + \frac{1}{x^2}\right) &= 194 \Rightarrow \left(x + \frac{1}{x}\right)^2 = \left(x^2 + \frac{1}{x^2} + 2\right) = 196 \\ \text{Since } x > 0, \quad \therefore \quad \left(x + \frac{1}{x}\right) &= +\sqrt{196} = +14 \quad [\because a^3 + b^3 = (a+b)(a^2 - ab + b^2)] \\ \therefore \quad \left(x^3 + \frac{1}{x^3}\right) &= \left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - 1\right) = 14 \times 193 = 2702\end{aligned}$$

QUESTION ANALYTICS

+

Q. 6

Solution Video

Have any Doubt?

Q

In right angled triangle  $ABC$  with angle  $B = 90^\circ$ , lengths of the side  $AB = 1$  cm and of  $BC = \sqrt{3}$  cm. A point  $D$  is selected on side  $CA$ . What is ratio of  $AD : DC$  such that  $BD$  is perpendicular to  $CA$ ?

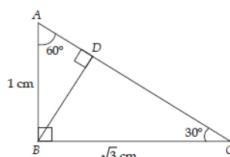
**A** 1:2

**B** 1:3

Correct Option

**Solution :**  
(b)

In a right angled triangle if ratio of two perpendicular sides is  $1:\sqrt{3}$ ,  
then the triangle is a  $30^\circ - 60^\circ - 90^\circ$  triangle



$$\begin{aligned}\Rightarrow \quad \angle BAC &= 60^\circ \\ \angle BCA &= 30^\circ \\ \text{Given:} \quad BD \perp AC \\ \Rightarrow \quad \angle DBC &= 60^\circ \\ \text{and} \quad \angle DAB &= 60^\circ \text{ and } \angle DBA = 30^\circ \\ \text{Right } \triangle BAD \text{ and } CBD \text{ are also } 30^\circ - 60^\circ - 90^\circ \text{ triangles.}\end{aligned}$$

$$\Rightarrow \quad AD : BD : AB = 1 : \sqrt{3} : 2$$

$$\text{and} \quad BD : DC : BC = 1 : \sqrt{3} : 2$$

Which enables us to compute

$$AD = \frac{AB}{2} = \frac{1}{2}$$

$$\text{and} \quad CD = \frac{\sqrt{3}}{2/\sqrt{3}} = \frac{3}{2}$$

$$\Rightarrow \quad AD : DC = \frac{1}{2} : \frac{3}{2} = 1 : 3$$

**C** 2:3

**D** 2:5

Q. 7

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

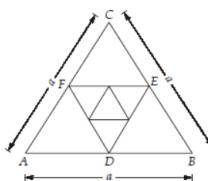
A triangle is drawn by joining the mid points of the side of a given triangle. A third triangle is drawn inside the second square in the same way and this process continues infinitely. If the side of first triangle is ' $a$ ' then find the sum of the areas of all the triangles.

**A**  $\frac{\sqrt{3}}{4}a^2$

**B**  $\frac{a^2}{\sqrt{3}}$

Correct Option

Solution :  
(b)



Let  $a$  be the side length of initial triangle, i.e.,

$$AB = BC = AC = a$$

$$DE = EF = DF = \frac{a}{2}$$

Similarly for next triangle,

$$\text{Side} = \frac{a}{4}$$

$$\text{Sum of areas} = \frac{\sqrt{3}}{4}(a)^2 + \frac{\sqrt{3}}{4}\left(\frac{a}{2}\right)^2 + \frac{\sqrt{3}}{4}\left(\frac{a}{4}\right)^2 \dots$$

$$= \frac{\sqrt{3}}{4}(a)^2 \left[ 1 + \frac{1}{2^2} + \frac{1}{2^4} + \frac{1}{2^6} \dots \right]$$

$$= \frac{\sqrt{3}}{4}a^2 \times \frac{1}{1 - \frac{1}{4}} = \frac{\sqrt{3}a^2}{4} \times \frac{4}{3}$$

$$= \frac{a^2}{\sqrt{3}}$$

**C**  $\frac{\sqrt{3}a^2}{2}$

**D**  $\frac{a^2}{2\sqrt{3}}$

Q. 8

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

Ajay and Vijay live at the 2 extreme ends of a lane and walk towards each other's house. If both of them start at 10:00 from their respective houses, they meet after 10 minutes but if Vijay starts at 10:00 and Ajay starts 4 minutes later, they meet at 10:13. On a given day, if Ajay starts from his house at 11:00 towards Vijay's house at the same pace as he normally walks, at what time will he reach Vijay's house?

**A** between 11:10 and 11:12

**B** between 11:12 and 11:13

**C** between 11:13 and 11:14

Correct Option

Solution :  
(c)

Let ' $A'$  and ' $V$ ' m/sec be the regular speed of Ajay and Vijay respectively. As per the question, we can write the following relationship:

$$D = 10A + 10V$$

and  $D = 9A + 13V$  which is also equal to  $10A + 10V$ , giving  $A = 3V$  or speed of Ajay is 3 times that of Vijay and total distance is 40V

To find out the time taken by Ajay to reach Vijay's house, simply divide  $D/A = 40V/3V = 40/3$  minutes or 13 minutes 20 seconds i.e. between 11:13 and 11:14 which is option (c).

**D** between 11:12 and 11:15

Q. 9

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

A construction company got the contract for making the dam and deadline was December, 2019. But the work got delayed by one month and completed in January, 2020. For this delay, the company was supposed to pay fine of ₹ 40,000 for the first day of extra time. This amount increased by ₹ 2,000 each day. Due to this reason, company suffered a loss of 20% than earlier estimated revenue in crores of rupees for making the dam

A ₹ 1.01

B ₹ 0.75

C ₹ 0.217

D ₹ 1.085

Correct Option

**Solution :**

(d)

The sum of money that the company was supposed to pay for the period of one month.

$$\begin{aligned} S_n &= \frac{n}{2}[2a + (n-1)d] \quad (\because \text{January month has 31 days}) \\ &= \frac{31}{2}[2 \times 40,000 + (31-1) \times 2000] \\ &= 2170000 \end{aligned}$$

∴ loss in business = 20%

∴ Amount received for making the dam

$$\begin{aligned} &= \frac{2170000}{0.2} = 10850000 \\ &= \text{Rs. 1.085 crores} \end{aligned}$$

 QUESTION ANALYTICS

+

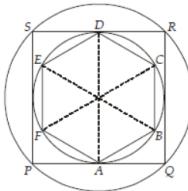
Q. 10

 Solution Video

 Have any Doubt ?

QUESTION

Hexagon ABCDEF is drawn inside the circle of radius  $r$  which is also covered by square PQRS. If an outer circle also covers this square as shown, then determine which of the following option(s) are INCORRECT?



A The difference between the area of inner circle and hexagon is greater than the difference between the area of square and inner circle.

Correct Option

B The sum of area of hexagon and inner circle is greater than the area of outer circle.

Correct Option

C The sum of area of hexagon and outer circle is greater than the area of inner circle and square.

D The difference between area of outer circle and inner circle is greater than the difference between the area of square and hexagon.

YOUR ANSWER - NA

CORRECT ANSWER - a,b

STATUS - SKIPPED

**Solution :**

(a,b)

Given the radius of inner circle =  $r$

∴ Side of hexagon =  $r$

$$\begin{aligned} \text{Area of hexagon} &= 6 \times \frac{\sqrt{3}}{4} r^2 \\ &= \frac{3\sqrt{3}}{2} r^2 \end{aligned}$$

Area of inner circle =  $\pi r^2$

Area of square =  $(2r)^2 = 4r^2$

Area of outer circle =  $\pi(\sqrt{2}r)^2 = 2\pi r^2$

$$(a) \pi r^2 - \frac{3\sqrt{3}r^2}{2} > 4r^2 - \pi r^2$$

$$(b) \pi r^2 + \frac{3\sqrt{3}r^2}{2} > 2\pi r^2$$

$$(c) \frac{3\sqrt{3}r^2}{2} + 2\pi r^2 > 4r^2 + \pi r^2$$

$$(d) 2\pi r^2 - \pi r^2 > 4r^2 - \frac{3\sqrt{3}r^2}{2}$$

 QUESTION ANALYTICS

+



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[NEWS](#)
[TEST SCHEDULE](#)

## GATE MOCK TEST 4 (GATE - 2021) - REPORTS

[OVERALL ANALYSIS](#)
[COMPARISON REPORT](#)
[SOLUTION REPORT](#)
[ALL\(65\)](#)
[CORRECT\(0\)](#)
[INCORRECT\(0\)](#)
[SKIPPED\(65\)](#)
**Q. 11**
[Have any Doubt ?](#)


State which of the following instructions should be allowed in Kernel mode and user mode?

- I. Disable all interrupts.
- II. Multiply 2 matrices.
- III. Set the time-of-day clock.

 A Kernel mode: I, II and III

 B Kernel mode: III and User mode: I and II

 C Kernel mode: I and III and User mode: II

Correct Option

**Solution :**

(c)

- All privilege instructions execution is Kernel mode not in user mode.
- Privilege instructions are disabling interrupts, set the clock, change page table etc.
- Multiply 2 matrices can be done in user mode.

 D Kernel mode: II and III and User mode: I

[QUESTION ANALYTICS](#)

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


What is the output of the following code?

```
#include <stdio.h>
void main()
{
    char arr[] = "\0";
    if (printf("%s\n", arr))
        printf("Nothing\n");
    else
        printf("something\n");
}
```

 A Nothing

Correct Option

**Solution :**

(a)

Output: Nothing

printf will return an integer 1 depending on the number of characters that are printed.

 B Something

 C Neither nothing nor something will be printed

 D Compilation error

[QUESTION ANALYTICS](#)

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

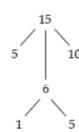

Six light bulbs are chosen at random from 15 bulbs of which 5 are defective. What is the probability that exactly one is defective?

 A  $\frac{15C_5 \times 10C_6}{15C_6}$ 
 B  $\frac{5C_1 \times 10C_5}{15C_6}$ 

Correct Option

**Solution :**

(b)



$$\text{Probability} = \frac{^5C_1 \times ^{10}C_5}{^{15}C_6}$$

**C**  $\frac{^5C_1 \times ^{10}C_5}{^{15}C_6}$

**D**  $\frac{^5C_0 \times ^{10}C_6}{^{15}C_6}$

QUESTION ANALYTICS +

Q. 14

Have any Doubt ?

The power set  $P((A \times B) \cup (B \times A))$  has the same number of elements as the power set  $P((A \times B) \cup (A \times B))$  if and only if

**A**  $A \neq B$

**B**  $B = \emptyset$  or  $A = B$

**C**  $A = \emptyset$  or  $B = \emptyset$  or  $A \cap B = \emptyset$

**D**  $A = \emptyset$  or  $B = \emptyset$  or  $A = B$

Correct Option

Solution :

(d)

To have same number of elements either  $A = \emptyset$  or  $B = \emptyset$  or  $A = B$ .

- Option (b) does not include  $A = \emptyset$ . Hence it is wrong.
- Option (d) contains all three.

QUESTION ANALYTICS +

Q. 15

Solution Video

Have any Doubt ?

Let  $b > 1$ . Then  $\log_b ((n^2)!)$  is

**A**  $\Theta(\log_b(n!))$

**B**  $\Theta(n \log_b(n^2))$

**C**  $\Theta(n \log_b(n))$

**D**  $\Theta(n^2 \log_b(n))$

Correct Option

Solution :

(d)

We can write  $O(n!) = n^n$

Given,  $\log_b ((n^2)!) = \log_b ((n^2)^{n^2})$   
 $= n^2 \log_b(n^2)$   
 $= 2n^2 \log_b n$   
 $= \Theta(n^2 \log_b n)$

QUESTION ANALYTICS +

Q. 16

Have any Doubt ?

Which of the following is/are correct?

**A** Multi-programming makes efficient use of the CPU by overlapping the demands for the CPU and I/O devices from various users.

Correct Option

**B** Privileged instructions cannot be executed in Kernel mode.

**C** If a Kernel is single-threaded, system calls from any thread can block the entire task.

Correct Option

**D** Long-term scheduler (or job scheduler) selects which processes should be brought into the ready queue and balances load for better throughput.

Correct Option

YOUR ANSWER - NA

CORRECT ANSWER - a,c,d

STATUS - SKIPPED

**Solution :**

- (a, c, d)
- The instructions that can run only in Kernel mode are called privileged instructions. So option (b) is false.
  - Use of threads provides concurrency within a process. The major disadvantage if the Kernel is single threaded, a system call of one thread will block the whole process and CPU may be idle during blocking period. So option (c) is correct.

QUESTION ANALYTICS



Q. 17

FAQ

Have any Doubt ?



There are K people in a room, each person picks a day of the year to get a free dinner at a fancy restaurant. K is such that there must be at least one group of six people who select the same day. What is the smallest such K if the year is a leap year?

1831

Correct Option

**Solution :**

1831  
Leap year has 366 days. We know,

$$\left\lfloor \frac{n-1}{m} \right\rfloor + 1 = 6$$

Here  $m = 366$ . Remove the floor function and solve it you will get 1831.

QUESTION ANALYTICS



Q. 18

Solution Video

Have any Doubt ?



The data rate of 10Base5 is 10 Mbps. How long does it take to create the smallest frame? \_\_\_\_\_ (Upto 1 decimal places).

51.2

Correct Option

**Solution :**

51.2  
The smallest frame is 64 bytes or 512 bits. With a data rate of 10 Mbps, we have

$$T_{fr} = \frac{512 \text{ bits}}{10 \text{ Mbps}} = 51.2 \mu\text{s}$$

QUESTION ANALYTICS



Q. 19

FAQ

Solution Video

Have any Doubt ?



A 4 Mbps token ring has a holding time value of 10 ms. The longest frame that can be sent on this ring (in bits) is \_\_\_\_\_.

40000

Correct Option

**Solution :**

40000  
Data rate = 4 Mbps  
Token holding time = 10 msec  
Frame length = Data rate × Token holding time  
Frame length =  $4 \times 10^6 \times 10 \times 10^{-3} = 40000$  bits

QUESTION ANALYTICS



Q. 20

Have any Doubt ?



Consider the following CFG and LL(1) table.

$S \rightarrow gATe$	$g$	$e$	$\$$
$S \rightarrow gATe$			
$A \rightarrow gA \epsilon$	$A$	$E_1$	$E_2$
$T \rightarrow gA \epsilon$	$T$	$T \rightarrow gA$	

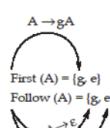
Find the number of productions entered at  $E_1$  \_\_\_\_\_.

2

Correct Option

**Solution :**

2





∴  $E_1 = \{A \rightarrow gA, A \rightarrow \epsilon\}$  and  $E_2 = \{A \rightarrow \epsilon\}$   
There are two productions at  $E_1$ .

 QUESTION ANALYTICS



Item 11-20 of 65 [« previous](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [next »](#)



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[TEST SCHEDULE](#)

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[OVERALL ANALYSIS](#)   [COMPARISON REPORT](#)   **SOLUTION REPORT**
[ALL\(65\)](#)   [CORRECT\(0\)](#)   [INCORRECT\(0\)](#)   [SKIPPED\(65\)](#)
**Q. 21**
[▶ Solution Video](#)
[Have any Doubt ?](#)

 Let the function  $f(x) = x^2 - 32\sqrt{x}$ 
 $S_1 : f$  is increasing for  $x > 4$ .

 $S_2 : f$  is decreasing for  $0 < x < 4$ .

Which of the above statements are TRUE?

**A**  $S_1$  only

**B**  $S_2$  only

**C** Both  $S_1$  and  $S_2$ 
[Correct Option](#)
**Solution :**

(c)

$$\begin{aligned} f(x) &= x^2 - 32\sqrt{x} \\ \Rightarrow f'(x) &= 2x - 32 \cdot \frac{1}{2} \cdot x^{-1/2} \\ &= 2x - \frac{16}{\sqrt{x}} = \frac{2(x^{3/2} - 8)}{\sqrt{x}} \\ f'(x) = 0 &\Rightarrow x^{3/2} = 8 \\ &\Rightarrow x = 4 \end{aligned}$$

 If  $x > 4 \Rightarrow f$  is increasing [ $f'(x)$  is +ve]

 If  $0 < x < 4 \Rightarrow f$  is decreasing [ $f'(x)$  is -ve]

**D** Neither  $S_1$  nor  $S_2$ 
[QUESTION ANALYTICS](#)

**Q. 22**
[Have any Doubt ?](#)


What will be the output of the following program if the size of integer is 4 bytes.

```
#include <stdio.h>
main()
{
    extern int num;
    num = 20;
    printf("%d", sizeof (num));
}
```

**A** Extern can't have int type variable

**B** 4

**C** Compilation error

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

(c)

Output: Error

The variable num is not declared before referring it by using extern. The correct code without error will be

```
main()
{
    int num;
    printf("%d", sizeof (num));
}
extern int num = 20;
```

**D** Variable num should be declared while defining

[QUESTION ANALYTICS](#)

**Q. 23**
[Have any Doubt ?](#)

 The minimum size that an array may require to store a binary tree with ' $n$ ' nodes is \_\_\_\_\_.

**A**  $2^{\lceil \log_2(n+1) \rceil} - 1$ 
[Correct Option](#)

**Solution :**

(a) In case of full or complete binary tree minimum height  $\Rightarrow h_{\min} = \lceil \log_2(n+1) \rceil$

Hence, last element will be stored at  $2^{h_{\min}} - 1$

$$\therefore \text{Minimum size} = 2^{\lceil \log_2(n+1) \rceil} - 1$$

**B**  $2^n - 1$

**C**  $2^n - n + 1$

**D**  $n + 1$

 QUESTION ANALYTICS



**Q. 24**

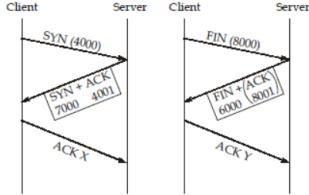
 Solution Video

 Have any Doubt ?



Consider the following TCP connection where only control segments are exchanged. The TCP follows the same 3-way handshaking procedure as in circuit switching. FIN and SYN have the usual meaning of TCP connections.

What are the possible values of X and Y respectively?



**A** 4002, 8002

**B** 4001, 8001

**C** 7000, 6000

**D** 7001, 6001

Correct Option

**Solution :**

(d)

The respective values are 7001, 6001.

As these are only control segments, no data is shared. Only 1 sequence number is consumed.

Hence 7001, 6001 is correct answer.

 QUESTION ANALYTICS



**Q. 25**

 Solution Video

 Have any Doubt ?



Which of the following describes the number of links and number of ports at each host respectively required to set up mesh network of N-hosts?

**A**  $N C_2, N + 1$

**B**  $\frac{N(N-1)}{2}, N - 1$

Correct Option

**Solution :**

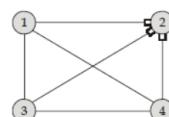
(b)

Example:  $N = 4$

3-ports at each Node

Number of links = 6 (i.e.  ${}^4 C_2 = 6$ )

$$\therefore \frac{N(N-1)}{2} \text{ links and } N - 1 \text{ ports}$$



**C**  $N C_2, 2N + 1$

**D**  $\frac{N(N-1)}{2}, 2N - 1$

 QUESTION ANALYTICS



**Q. 26**

 FAQ

 Solution Video

 Have any Doubt ?



In nibble, the two's complement of the hexadecimal number  $(2AF)_{16}$  is \_\_\_\_\_.

311101

Correct Option

Solution :  
311101

$$2AF = 0010 \quad 1010 \quad 1111$$

$$\text{2's complement} = \begin{array}{cccccc} 1 & 1 & 0 & 1 & 0 & 1 \\ \square & \square & \square & \square & \square & \square \\ 3 & 1 & 1 & 1 & 0 & 1 \end{array}$$

$$\text{Octal number} = (311101)_4$$

QUESTION ANALYTICS

Q. 27

Solution Video

Have any Doubt ?



Consider execution of 100 instructions on a 5 stage pipeline. Let P be the probability of an instruction being a branch. What must be the value of P such that speed up is atleast 4? \_\_\_\_\_ (Upto 2 decimal places) [Assume each stage takes 1 cycle to perform it's task and branch is predicted on fourth stage of the pipeline]

0.08 (0.080 - 0.083)

Correct Option

Solution :  
0.08 (0.080 - 0.083)

$$\text{Speed up} = \frac{\text{Pipeline depth}}{(1 + \text{Branch frequency} \times \text{Branch penalty})} \geq 4$$

$$\frac{5}{1 + P \times 3} \geq 4$$

$$4 + 12P \leq 5$$

$$12P \leq 1$$

$$P \leq \frac{1}{12}$$

QUESTION ANALYTICS

Q. 28

FAQ Solution Video

Have any Doubt ?



Consider 3 transactions  $T_1$ ,  $T_2$  and  $T_3$  having 2, 3 and 4 operations respectively. Find number of concurrent schedules.

1260

Correct Option

Solution :  
1260

If  $T_1$ ,  $T_2$  and  $T_3$  are transactions with  $p$ ,  $q$  and  $r$  operations respectively

$$\text{Number of concurrent schedules} = \frac{(p+q+r)!}{p!q!r!} = \frac{(2+3+4)!}{2!3!1!} = \frac{9!}{2 \times 6 \times 4!}$$
$$= \frac{9 \times 8 \times 7 \times 6 \times 5}{2 \times 6} = 63 \times 20 = 1260$$

QUESTION ANALYTICS

Q. 29

Have any Doubt ?



In a particular number system the cubic equation  $x^3 + bx^2 + cx - 190 = 0$  has roots  $x = 5$ ,  $x = 8$  and  $x = 9$ . The base of the number system is \_\_\_\_\_.

15

Correct Option

Solution :  
15

Let the base of the system is  $B$

$$9 \times 8 \times 5 = (190)_B$$

$$(360)_{10} = (190)_B$$

$$360 = B^2 + 9B + 0$$

$$B^2 + 9B - 360 = 0$$

$$B = 15, B = -24$$

Since base can not be negative.

$$\Rightarrow \text{Base, } B = 15$$

QUESTION ANALYTICS

Q. 30

Have any Doubt ?



An OS uses multilevel feedback queues for process scheduling and a process in this OS needs 40 ms for execution. If the first queue uses 2 ms time quantum and for each

level time quantum of the level is time quantum of previous level plus 5 ms, a process will finish processing in level \_\_\_\_\_. (Suppose that the level with 2 ms quantum time is the level 1).

5

Correct Option

Solution :

5

Process requires 40 ms

2 → 1<sup>st</sup> level  
7 → 2<sup>nd</sup> level  
12 → 3<sup>rd</sup> level  
17 → 4<sup>th</sup> level (38 ms finished 2 ms left)  
2 → 5<sup>th</sup> level (finished at 5<sup>th</sup> level)

 QUESTION ANALYTICS

+

Item 21-30 of 65 « previous 1 2 3 4 5 6 7 next »



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## GATE MOCK TEST 4 (GATE - 2021) - REPORTS

[OVERALL ANALYSIS](#)
[COMPARISON REPORT](#)
[SOLUTION REPORT](#)
[ALL\(65\)](#)
[CORRECT\(0\)](#)
[INCORRECT\(0\)](#)
[SKIPPED\(65\)](#)
**Q. 31**
[Have any Doubt ?](#)


Which of the following is the negation of the statement, "For all odd primes  $p < q$  there exists positive non-primes  $r < s$  such that  $p^2 + q^2 = r^2 + s^2$ ."

- A For all odd primes  $p < q$  there exists positive non-primes  $r < s$  such that  $p^2 + q^2 \neq r^2 + s^2$ .
- B There exists odd primes  $p < q$  such that for all positive non-primes  $r < s$ ,  $p^2 + q^2 = r^2 + s^2$ .
- C There exists odd primes  $p < q$  and there exists positive non-primes  $r < s$  such that  $p^2 + q^2 \neq r^2 + s^2$ .
- D There exists odd primes  $p < q$  such that for all positive non-primes  $r < s$ ,  $p^2 + q^2 \neq r^2 + s^2$ .

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

(d)

Given statement:

x : Odd primes

y : Positive non-primes

 $S : \forall x(p < q) \exists y(r < s) (p^2 + q^2 = r^2 + s^2)$ 
 $S' : \exists x(p < q) \forall y(r < s) (p^2 + q^2 \neq r^2 + s^2)$ 
**QUESTION ANALYTICS**

**Q. 32**
[Solution Video](#)
[Have any Doubt ?](#)


Identify the false statements:

 $S_1$  : Separate I/O address space does not necessarily mean that I/O address lines are physically separated.

 $S_2$  : Address decoder is an essential part of I/O interface.

- A Only  $S_1$
- B Only  $S_2$
- C Both  $S_1$  and  $S_2$
- D Neither  $S_1$  nor  $S_2$

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

(d)

 $S_1$  : Separate I/O address space does not necessarily mean that I/O address lines are physically separated from the memory address lines. A special signal on the bus indicates that the requested read or write transfer is an I/O operation.

 $S_2$  : The address decoder, the data and status register and control circuitry required to coordinate I/O transfers constitute the interface circuit (Hence true).

**QUESTION ANALYTICS**

**Q. 33**
[Solution Video](#)
[Have any Doubt ?](#)


Effective address is calculated by adding or subtracting displacement value to

- A Relative address
- B Absolute address
- C Base address
- D Immediate address

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

(c)

Effective address is calculated by adding or subtracting displacement value to base address.

**QUESTION ANALYTICS**


Q. 34



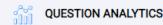
Identify the correct statement from the following

- A Commutative property not holds for addition of matrices
- B Associative property not holds for addition of matrices
- C Commutative property not holds for multiplication of matrices
- D None of the above

Correct Option

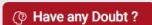
Solution :

(c) Commutative for multiplication of matrices does not hold.  
 $AB \neq BA$



+

Q. 35



What could the output of the concurrent execution of process A and process B be?

Initialization:

```
int x = 0;
int y = 0;
Process A:
while (x == 0) {do-nothing};
printf("a");
y = 1;
y = 0;
printf("d");
y = 1;
```

```
Process B
printf("b");
x = 1;
while (y == 0) {do-nothing};
printf("c");
```

 A bcd

 B badc

Correct Option

 C bacd

Correct Option

 D bdac

YOUR ANSWER - NA

CORRECT ANSWER - b,c

STATUS - SKIPPED

Solution :

(b, c)

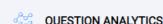
Since x is initialized to 0 process A can never print unless x = 1.

So process B always prints 'b'.

Now process B can not print further unless y is 1. So surely after 'b' a will be printed i.e. 'ba'.

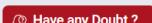
Now the remaining printf("c") and printf("d") can be executed concurrently.

Hence final output could be "badc" and "bacd".



+

Q. 36



Which of the following statements is/are TRUE?

 A  $\{2, 3, 4\} \subseteq A$  implies that  $2 \in A$  and  $\{3, 4\} \subseteq A$ .

Correct Option

 B  $\{2, 3, 4\} \in A$  and  $\{2, 3\} \in B$  implies that  $\{4\} \subseteq A - B$ .

 C  $A \cap B \supseteq \{2, 3, 4\}$  implies that  $\{2, 3, 4\} \subseteq A$  and  $\{2, 3, 4\} \subseteq B$ .

Correct Option

 D  $A - B \supseteq \{3, 4\}$  and  $\{1, 2\} \subseteq B$  implies that  $\{1, 2, 3, 4\} \subseteq A \cup B$ .

Correct Option

YOUR ANSWER - NA

CORRECT ANSWER - a,c,d

STATUS - SKIPPED

Solution :

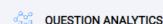
(a, c, d)

Option (b) is false.

$\{2, 3, 4\} \in A$  means  $\{2, 3, 4\}$  itself a element cannot be divided.

Similarly  $\{2, 3\} \in B$  itself a element of 3.

$$A - B = \{\{2, 3, 4\}\} - \{\{2, 3\}\} = \{\{2, 3, 4\}\}$$



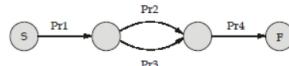
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Q. 37

Have any Doubt?



Consider the following flow graph (representing 9 processes executing concurrently)



- P (or wait) is used to acquire a resource. It waits for semaphore to become positive, then decrements it by 1.
  - V (or signal) is used to release a resource. It increments the semaphore by 1, waking up the blocked processes, if any.
- Which of the following is correct to enforce the correct order of execution?

**A** s1 = 1; s2 = 0; s3 = 0;  
Pr1: body; V(s1); V(s1);  
Pr2: P(s1); body; V(s2);  
Pr3: P(s1); body; V(s3);  
Pr4: P(s2); P(s3); body;

**B** s1 = 0; s2 = 0; s3 = 0;  
Pr1: body; V(s1); V(s1);  
Pr3: P(s1); body; V(s3);  
Pr2: P(s1); body; V(s2);  
Pr4: P(s2); body; P(s3);

**C** s1 = 0; s2 = 1; s3 = 0;  
Pr1: body; V(s1); V(s1);  
Pr2: P(s1); body; V(s2);  
Pr3: P(s1); body; V(s3);  
Pr4: P(s2); P(s3); body;

**D** s1 = 0; s2 = 0; s3 = 0;  
Pr1: body; V(s1); V(s1);  
Pr2: P(s1); body; V(s2);  
Pr3: P(s1); body; V(s3);  
Pr4: P(s2); P(s3); body;

Correct Option

**Solution :**

(d)

- Pr2 and Pr3 are independent and can be executed concurrently but only after execution of Pr1.
- Pr4 is the last process and is dependent on all other process (Pr1, Pr2, Pr3). Hence it will be executed last.

So option (d) is the correct solution for executing concurrently and enforce the correct order of execution.

QUESTION ANALYTICS



Q. 38

FAQ Have any Doubt?



What is the output of the code?

```
#include <stdio.h>
main()
{
    struct first
    {
        char city[15];
        char *str;
    };
    struct second;
    {
        char *city;
        struct first fst;
    }
    static struct b snd = {"Bangalore",
    "Madras", "Delhi"};
    printf("%s %s %s\n", snd.city,
    snd.fst.city, snd.fst.str);
    printf("%s %s\n", ++snd.city,
    ++snd.fst.str);
}
```

**A** Compilation error

**B** Bangalore Madras Delhi angalore elhi

Correct Option

**Solution :**

(b)

snd.city returns base address of string city as per the format specifier %s, address is pre-incremented by ++, now second location's address is returned for %s. Similarly, ++and.fst.str.

**C** Bangalore adres elhi Bangalore Delhi

**D** Bangalore Delhi Madras angalore elhi

QUESTION ANALYTICS



Consider the statement form  $p \Rightarrow q$  where  $p = \text{"If Tom is Jane's father then Jane is Bill's niece"}$  and  $q = \text{"Bill is Tom's brother."}$  Which of the following statements is equivalent to this statement?

**A** If Bill is Tom's Brother, then Tom is Jane's father and Jane is not Bill's niece.

**B** If Bill is not Tom's Brother, then Tom is Jane's father and Jane is not Bill's niece.

Correct Option

**Solution :**

(b)

$$p \Rightarrow q$$

Contrapositive is  $\neg q \Rightarrow \neg p$

$$= \frac{\neg(\text{Bill is Tom's brother})}{q} \Rightarrow \frac{\neg(\text{Tom is Jane's father})}{s} \text{ then } \frac{\neg(\text{Jane is Bill's niece})}{t}$$

$$= \neg(\text{Bill is Tom's brother}) \Rightarrow \neg(s \rightarrow t)$$

$$\neg q \Rightarrow \neg(s' + t)$$

$$\neg q \Rightarrow s \wedge t'$$

In words "If Bill is not Tom's brother then Tom is Jane's father and Jane is not Bill's niece".

**C** If Bill is not Tom's Brother, then Tom is not Jane's father and Jane is not Bill's niece.

**D** If Bill is Tom's Brother, then Tom is Jane's father and Jane is Bill's niece.

QUESTION ANALYTICS

+

Consider the recurrence relation  $a_k = -8a_{k-1} - 15a_{k-2}$  with initial conditions  $a_0 = 0$  and  $a_1 = 2$ . Which of the following is an explicit solution to this recurrence relation?

**A**  $a_k = (-3)^k - (-5)^k$

Correct Option

**Solution :**

(a)

Given recurrence relation is

$$\begin{aligned} a_k &= -8a_{k-1} - 15a_{k-2} \\ \text{So, } t^2 &= -8t - 15 \end{aligned}$$

$$t^2 + 8t + 15 = 0$$

$$t^2 + 5t + 3t + 15 = 0$$

$$t(t+5) + 3(t+5) = 0$$

$$(t+5)(t+3) = 0$$

$$t = -5, -3$$

$$\text{So, } a_k = (-5)^k \cdot C_1 + C_2(-3)^k$$

$$k = 0 \text{ then } a_0 = 0$$

$$0 = (-5)^0 C_1 + C_2(-3)^0$$

$$C_1 + C_2 = 0$$

$$C_1 = -C_2$$

$$k = 1 \text{ then } a_1 = 2$$

$$(-5)^1 \cdot C_1 + C_2(-3)^1 = 2$$

$$-5C_1 - 3C_2 = 2$$

... (i)

... (ii)

Using (i) and (ii) put  $C_1 = -C_2$  in (ii)

$$+5C_2 - 3C_2 = 2$$

$$2C_2 = 2$$

$$C_2 = 1, C_1 = -1$$

So using the values of  $C_1$  and  $C_2$ , Solution to this recurrence relation will be

$$a_k = (-5)^k - (-5)^k$$

or

$$a_k = (-1)(-5)^k + 1(-5)^k \text{ which is same as choice (a).}$$

**B**  $a_k = k(-3)^k - k(-5)^k$

**C**  $a_k = k(-3)^k - (-5)^k$

**D**  $a_k = k(-5)^k - k(-3)^k$

QUESTION ANALYTICS

+



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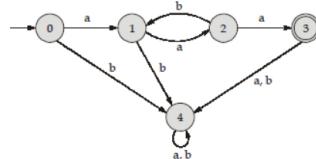
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**Q. 41**
[Have any Doubt ?](#)


What is the language accepted by the DFA given below:


**A**  $(a+b)(ab)^*$ 
**B**  $(a+b)^*$ 
**C**  $b(ab)^*aa$ 
**D**  $a(ab)^*aa$ 

Correct Option

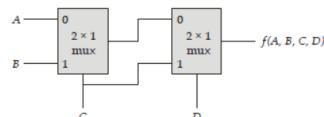
**Solution :**

(d)

This DFA has a cycle: 1 → 2 → 1 and it can go through this cycle any number of times by reading substring ab repeatedly. To find the language it accepts, first from the initial state go to state 1 by reading one a. Then from state 1 go through the cycle 1 → 2 → 1 any number of times by reading substring ab any number of times to come back to state 1. This is represented by  $(ab)^*$ . Then from state 1 go to state 2 and then to state 3 by reading aa. Thus a string that is accepted by this DFA can be represented by  $a(ab)^*aa$ .

QUESTION ANALYTICS

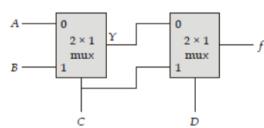

**Q. 42**
[Solution Video](#)
[Have any Doubt ?](#)

 Consider the logic circuit given below. The min terms in  $f(A, B, C, D)$  are \_\_\_\_\_.

**A**  $\Sigma m (1, 3, 5, 6, 7, 11, 14)$ 
**B**  $\Sigma m (6, 7, 8, 12, 14, 15)$ 
**C**  $\Sigma m (3, 6, 7, 8, 11, 12, 14, 15)$ 

Correct Option

**Solution :**

(c)



$$Y = A\bar{C} + BC$$

$$f = Y\bar{D} + CD$$

$$f = (A\bar{C} + BC)\bar{D} + CD = A\bar{C}\bar{D} + BC\bar{D} + CD$$

$$= A(B + \bar{B})\bar{C}\bar{D} + (A + \bar{A})BC\bar{D} + (A + \bar{A})(B + \bar{B})CD$$

$$= AB\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + ABC\bar{D} + \bar{A}BC\bar{D} + ABCD + A\bar{B}CD + \bar{A}\bar{B}CD$$

$$= \Sigma m(12, 8, 14, 6, 15, 11, 7, 3)$$

$$f(A, B, C, D) = \Sigma m(3, 6, 7, 8, 11, 12, 14, 15)$$

**D**  $\Sigma m (3, 6, 7, 9, 11, 12, 14, 15)$ 

QUESTION ANALYTICS


**Q. 43**
[FAQ](#)
[Have any Doubt ?](#)


Let  $S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ . What is the smallest integer  $k$  such that any subset of  $S$  of size  $k$  contains two disjoint subsets of size two,  $\{x_1, x_2\}$  and  $\{y_1, y_2\}$ , such that  $x_1 + x_2 = y_1 + y_2 = 9$ ?

7

Correct Option

**Solution :**

7

Let,  $k = 5$

$\{0, 1, 2, 3, 4\}$  no subset makes 9

Let,  $k = 6$

$\{0, 1, 2, 3, 4, 5\}$

$$(x_1, x_2) = (4, 5) = 9$$

Now  $(y_1, y_2)$  can not be found in this subset.

Let,  $k = 7$

$\{0, 1, 2, 3, 4, 5, 6\}$

$$(x_1, x_2) = (6, 3) = 9$$

$$(y_1, y_2) = (4, 5) = 9$$

Hence 7 is minimum size of the subset.

QUESTION ANALYTICS



Q. 44

Have any Doubt ?



Suppose there are ten balls in an urn, four blue, four red and two green. The balls are also numbered 1 to 10. How many ways are there to select an ordered sample of four balls without replacement such that there are two blue balls and two red balls in the sample?

864

Correct Option

**Solution :**

864

$$\text{Total ways} = {}^4C_2 \times {}^4C_2 \times 4! = 864$$

QUESTION ANALYTICS



Q. 45

Have any Doubt ?



Consider the following code:

```
s := 0
for i := 1 to n
    s := s + i
    for j := 1 to i
        s := s + j * i
    next j
next i
s := s + 10
```

If  $n = 12$ , then the number of additions and multiplications in the above code is \_\_\_\_\_.

169

Correct Option

**Solution :**

169

- Outer loop runs  $n$ -times.
- Inner loop runs  $\frac{n(n+1)}{2}$  times.
- Inner loop has 1 addition and 1 multiplication.
- Outer loop has 1 addition.
- In the bottom 1 addition.

Given,  $n = 12$

$$\begin{aligned} \text{So, total[addition + multiplication]} &= n + \frac{n(n+1)}{2} \times 2 + 1 \\ &= 12 + 12 \times 13 + 1 = 169 \end{aligned}$$

QUESTION ANALYTICS



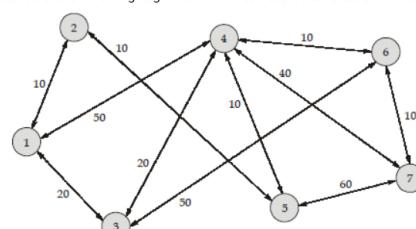
Q. 46

Solution Video

Have any Doubt ?



Consider the following segment of the Internet that consists of 7 nodes and 11 links. Assume all delays on the path in ms.



The difference between shortest path cost between node 1 to 7 of the above sample network and shortest route cost between nodes 1 to 7 if the delays on links 4 – 6 and 6 – 7 are both increased from 10 ms to 20 ms is \_\_\_\_\_.

- 20

Correct Option

**Solution :**

- 20

The shortest path between nodes 1 and 7, the cost is 50 ms. The path as traversing the links 1 - 2, 2 - 5, 5 - 4, 4 - 6 and 6 - 7.

Now, the shortest path between nodes 1 and 7 in the increased links 4 - 6 and 6 - 7, the cost is 70 ms. The path as traversing the links 1 - 2, 2 - 5, 5 - 4 and 4 - 7.

So,  $50 - 70 = -20$

## QUESTION ANALYTICS

+

Q. 47

? Have any Doubt ?

Q

Which of the following statements is/are TRUE?

**A**  $C - (B \cup A) = (C - B) - A$

Correct Option

**B**  $A - (C \cup B) = (A - B) - C$

Correct Option

**C**  $B - (A \cup C) = (B - C) - A$

Correct Option

**D**  $A - (B \cup C) = (B - C) - A$

YOUR ANSWER - NA

CORRECT ANSWER - a,b,c

STATUS - SKIPPED

**Solution :**

(a, b, c)

- Option (d) is incorrect. Lets see how  
LHS :  $A - (B \cup C) = A(B + C)' = AB'C'$   
RHS :  $(B - C) - A = (BC')A' = A'BC'$   
 $LHS \neq RHS$
- Option (a), (b) and (c) are correct because LHS = RHS in similar fashion as explained above.

## QUESTION ANALYTICS

+

Q. 48

? FAQ

? Have any Doubt ?

Q

Consider the following set of processes:

Process ID	Arrival Time	CPU Burst Time
$P_1$	0	2
$P_2$	2	3
$P_3$	1	1
$P_4$	3	2
$P_5$	3	2

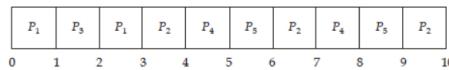
Assume the Round Robin scheduling algorithm is used with 1 time slice unit. The average waiting time of the processor is \_\_\_\_\_. (Upto 1 decimal places and lower process id given preference if tie happens).

2.6

Correct Option

**Solution :**

2.6



$$\text{Average waiting time} = \frac{1+5+0+3+4}{5} = \frac{13}{5} = 2.6$$

## QUESTION ANALYTICS

+

Q. 49

▶ Solution Video

? Have any Doubt ?

Q

A computer system contains a main memory of 32 K size with 16 bit words. It also has a 4 K word cache divided into 4 slot sets with 64 words per slot. Assume that the cache is initially empty. The processor fetches words from 0, 1, 2, ..., 4351 in that order repeatedly 10 times. Assume a LRU policy for block replacement. How many miss operations will occur?

248

Correct Option

**Solution :**

248

Cache holds 64 blocks without replacement.

CPU fetches words from 0 to 4351 (total 4352 words)

$$\text{Number of blocks required} = \frac{4352}{64} = 68 \text{ blocks}$$

1<sup>st</sup> time = 68 miss operations (initially cache was empty)

For 2<sup>nd</sup> time reference, the available blocks in cache are 64. But the misses ( $B_0, B_1, B_2$  and  $B_3$ ) lead

to subsequent misses of  $(B_{16} \text{ to } B_{19})$ ,  $(B_{32} \text{ to } B_{35})$ ,  $(B_{48} \text{ to } B_{51})$  and  $(B_{64} \text{ to } B_{67})$  with LRU policy. The same processes repeated 9 times.

$$\therefore \text{Total} = 68 + 9 \times (4 + 4 + 4 + 4 + 4) = 248$$

QUESTION ANALYTICS



Q. 50

Have any Doubt?



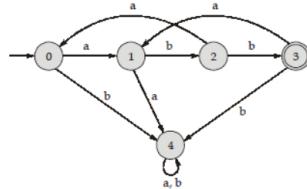
The number of states in DFA required for  $a(baa + bba)^*bb$  is \_\_\_\_\_.

5

Correct Option

Solution :

5



This DFA has two cycles: 1 - 2 - 0 - 1 and 1 - 2 - 3 - 1.

To find the language accepted by this DFA, first from state 0 go to state 1 by reading a (any other state which is common to these cycles such as state 2 can also be used instead of state 1). Then from state 1 go through the two cycles 1 - 2 - 0 - 1 and 1 - 2 - 3 - 1 any number of times in any order by reading substrings baa and bba, respectively. At this point a substring  $a(baa + bba)^*$  will have been read. Then go from state 1 to state 2 and then to state 3 by reading bb. Thus altogether  $a(baa + bba)^*bb$  will have been read when state 3 is reached from state 0.

QUESTION ANALYTICS



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



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## GATE MOCK TEST 4 (GATE - 2021) - REPORTS

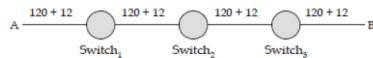
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[SOLUTION REPORT](#)
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[CORRECT\(0\)](#)
[INCORRECT\(0\)](#)
[SKIPPED\(65\)](#)
**Q. 51**
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Consider two machines, A and B, connected by a 100 Mbps ethernet with three store and forward relay switches in path between them. Suppose that no other machines are using the ethernet, each of the link introduces a propagation delay of 12  $\mu s$ , and switch begins transmitting a packet immediately after receiving the last bit of the packet immediately. The total transfer time for 1500 bytes packet, as measured from transmission of the first bit from A to the receipt of last bit at B is \_\_\_\_\_.

**528**
[Correct Option](#)
**Solution :**
**528**

Transmission time of A for putting packet on to the ethernet,

$$\frac{1500 \times 8}{10^6} = 120 \mu s$$



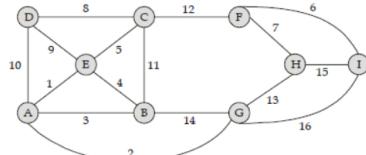
The time needed for last bit of packet to propagate to the first switch is 12  $\mu s$ . The time needed for first switch to transmit the packet to second switch is (120 + 12)  $\mu s$  and the same happens for remaining switches, each segment introduces a 120  $\mu s$   $T_{delay}$ , 12  $\mu s$   $P_{delay}$ .

Thus, Total latency = (120 + 12) + (120 + 12) + (120 + 12 + 120 + 12) = 528  $\mu s$

[QUESTION ANALYTICS](#)

**Q. 52**
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Consider the weighted undirected graph below:



Assume Prim's algorithm and Kruskal's algorithm are executed on the above graph to find the minimum spanning tree starting from vertex A. For a particular edge  $(e_i)$  which is included in minimum spanning tree and the position of an edge in minimum spanning tree is denoted by  $e_{pi}$ . Where  $1 \leq e_{pi} \leq 8$

(where position defines the order in which edges are included in the MST). Then what is the maximum value of  $| (e_{pi})_{Prim's} - (e_{pi})_{Kruskal's} |$  ?

**2**
[Correct Option](#)
**Solution :**
**2**

Kruskal's algorithm: AE, AG, AB, CE, FI, FH, CD, CF

Prim's algorithm: AE, AG, AB, CE, CD, CF, FI, FH

$$\max | (e_{pi})_{Prim's} - (e_{pi})_{Kruskal's} | = | 5 - 7 | = 2$$

[QUESTION ANALYTICS](#)

**Q. 53**
[FAQ](#)
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A full 3-ary tree is a tree in which every internal node has exactly 3 children. The number of leaf nodes in such a tree with 19 internal nodes will be \_\_\_\_\_.

**39**
[Correct Option](#)
**Solution :**
**39**

In a full array tree,  $n$  (total nodes),  $l$  (leaf nodes),  $i$  (internal nodes)

$$n = i + l \quad \dots(i)$$

$$n = mi + 1 \quad \dots(ii)$$

In this case

$$m = 3, i = 19$$

$$n = 19 + l \quad \dots(iii)$$

$$n = 3 \times 19 + 1 \quad \dots(iv)$$

Solving equation (iii) and (iv)

$$19 + l = 58$$

$$l = 39$$

So, leaf nodes = 39

Q. 54

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

What is the time complexity for counting the inversion pairs in an array size of  $n$ , using merge sort?

A  $O(n^2/\log n)$

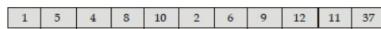
B  $O(n \log n)$

Correct Option

Solution :

(b)

- Divide the list into two pieces  $O(1)$ .
- Conquer: Recursively count inversions in each half  $\left\{2T\left(\frac{n}{2}\right)\right\}$ .



5-4, 5-2, 4-2, 8-2, 10-2 (5 inversions)      6-3, 9-3, 9-7, 12-3, 12-7, 12-11, 11-3, 11-7  
(8 inversions)

- Combine: Count inversions where  $a_i$  and  $a_j$  are in different halves, and return sum of these quantities.
- Merge takes:  $O(n)$

$$\begin{aligned} T(n) &\leq T\left(\frac{n}{2}\right) + T\left(\frac{n}{2}\right) + O(n) \\ T(n) &= O(n \log n) \end{aligned}$$

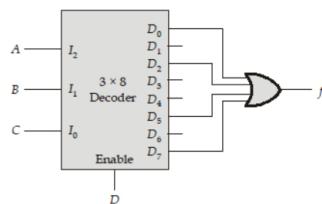
C  $O(n(\log n)^2)$

D  $O(n^2)$

Q. 55

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The logic function  $f(A, B, C, D)$  implemented by the circuit shown below is

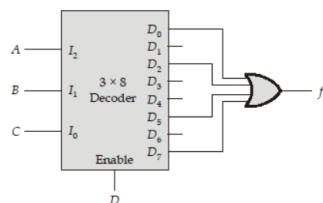


A  $\bar{D}(A \oplus C)$

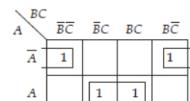
B  $D(A \odot C)$

Correct Option

Solution :  
(b)



A	B	C	D	f
X	X	X	0	0
0	0	0	1	1
0	0	1	1	0
0	1	0	1	1
0	1	1	1	0
1	0	0	1	0
1	0	1	1	1
1	1	0	1	0
1	1	1	1	1



$$f = D(\bar{A}\bar{C} + AC)$$

C  $\bar{D}(A \oplus B)$

D  $D(A \odot B)$

Q. 56

Have any Doubt?



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

## List-I

- A. Common sub-expression elimination  
 B. Constant folding  
 C. Strength reduction  
 D. Induction variable
- |     |   |   |   |
|-----|---|---|---|
| A   | B | C | D |
| (a) | 4 | 1 | 2 |
| (b) | 3 | 1 | 2 |
| (c) | 4 | 2 | 1 |
| (d) | 3 | 2 | 1 |

## List-II

- $x = 2 + 3$
- $x = x \times 2$
- for ( $i = 0; i < 10; i = i + 2$ )
- $x = (x + 2) \times (x + 2)$

**A** a

Correct Option

Solution :

(a) Common sub-expression elimination:  $x = (x + 2) \times (x + 2)$   
 Constant folding:  $x = 2 + 3 \Rightarrow x = 5$   
 Strength reduction:  $x = x \times 2 \Rightarrow x = x \ll 1$   
 Induction variable: for ( $i = 0; i < 10; i = i + 2$ )

**B** b**C** c**D** d

Q. 57

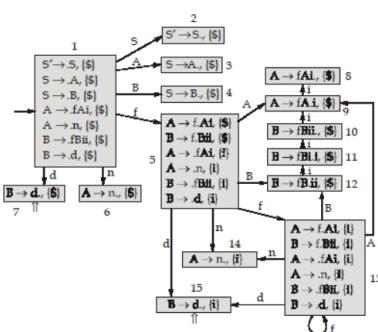
Have any Doubt?


 $S' \rightarrow S$   
 $S \rightarrow A \mid B$   
 $A \rightarrow fAi \mid n$   
 $B \rightarrow fBi \mid d$ 

For the above augmented grammar, the number of states in LR(1) parser are \_\_\_\_\_.

**A** 13**B** 14**C** 15

Correct Option

Solution :  
(c)**D** 16

Q. 58

Have any Doubt?



Consider the following codes i.e., coke machine that has 10 slots. Where the producer is the delivery person and the consumer is the student using the machine. The three semaphores are as follows:

```

• Semaphore mutex
• Semaphore fullbuffer /*Number of filled slots*/
• Semaphore emptybuffer /*Number of empty slots*/
#define NUM_SLOTS 10
semaphore mutex = 1
semaphore fullBuffer = x //x + y must equal 10
semaphore emptyBuffer = y //x + y must equal 10
delivery_person( )           student( )
{
    A _____          {
    B _____          P _____
    put_1_coke_in_machine( );   take_1_coke_from_machine( );
    C _____          R _____
    D _____          S _____
}

```

Which of the following at A, B, C, D, P, Q, R and S will make the machine deadlock free and mutual exclusion satisfied?

- A** A: wait(mutex)      B: wait(emptyBuffer)      C: signal(mutex)      D: signal(fullBuffer)  
P: wait(fullBuffer);      Q: wait(mutex);      R: signal(mutex)      S: signal(emptyBuffer)

- B** A: wait(emptyBuffer)      B: wait(mutex)      C: signal(mutex)      D: signal(fullBuffer)  
P: wait(fullBuffer);      Q: wait(mutex);      R: signal(mutex)      S: signal(emptyBuffer)

Correct Option

**Solution :**  
(b)  
Option (b) fulfil the need asked in question.

- C** A: wait(emptyBuffer)      B: signal(mutex)      C: wait(mutex)      D: signal(fullBuffer)  
P: wait(mutex);      Q: wait(fullBuffer);      R: signal(mutex)      S: signal(emptyBuffer)

- D** Not Possible to make the above code deadlock free and Mutual exclusion satisfied

#### QUESTION ANALYTICS



Q. 59

Solution Video

Have any Doubt ?



An 800 page book has 400 misprints. If the misprints are distributed uniformly throughout the book and the Poisson approximation to the binomial distribution is used to calculate the probability of exactly 2 misprints on page 16, which of the following represents the correct use of the Poisson approximation?

**A**  $\frac{e^2}{8}$

**B**  $\frac{e^{-0.5}}{8}$

Correct Option

**Solution :**  
(b)

$$\begin{aligned}\lambda &= \frac{400}{800} = 0.5 \\ P(x, \lambda) &= \frac{e^{-\lambda} \cdot \lambda^x}{x!} \\ P(x = 2, 0.5) &= \frac{e^{-0.5}(0.5)^2}{2!} = \frac{e^{-0.5}}{8}\end{aligned}$$

Hence option (b) is correct.

**C**  $e^2$

**D**  $\frac{e^{-0.5}}{16}$

#### QUESTION ANALYTICS



Q. 60

Solution Video

Have any Doubt ?



Assume the TCP round trip time RTT is currently 30 msec and the following ACK's come in after 26, 32 and 24 ms respectively. What is the new RTT estimate (in ms) using basic algorithm ( $\alpha = 0.9$ )? (where  $\alpha$  is smoothing factor) \_\_\_\_\_. (Upto 2 decimal places)

**29.25 (29.25 - 29.30)**

Correct Option

**Solution :**  
29.25 (29.25 - 29.30)

Smoothed round trip time proposed by Jacobson's is given as

$$ERTT = \alpha IRTT + (1 - \alpha) NRTT$$

where, ERTT is estimated RTT

IRTT is initial RTT

NRTT is new RTT,  $\alpha$  is the smoothly factor

When ACK comes after 26 ms

$$ERTT = (0.9) 30 + (0.1) 26 = 29.6 \text{ ms}$$

When 2nd ACK comes after 32 ms

$$ERTT = (0.9)(29.6) + (1 - 0.9) 32 = 29.84 \text{ ms}$$

When 3rd ACK comes after 24 sec

$$ERTT = (0.9)(29.84) + (1 - 0.9) 24 = 29.256 \text{ ms}$$





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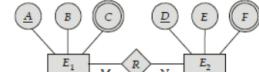
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[OVERALL ANALYSIS](#)
[COMPARISON REPORT](#)
[SOLUTION REPORT](#)
[ALL\(65\)](#)
[CORRECT\(0\)](#)
[INCORRECT\(0\)](#)
[SKIPPED\(65\)](#)
**Q. 61**
[Solution Video](#)
[Have any Doubt ?](#)


How many minimum tables (RDBMS tables) required for the following ER diagram which satisfy 2NF?


**5**
[Correct Option](#)
**Solution :**

5

$$\begin{array}{|c|c|c|c|c|} \hline (AC) & (AB) & (AD) & (DE) & DF \\ \hline A \rightarrow B & & D \rightarrow E & & \\ \hline \end{array}$$

[QUESTION ANALYTICS](#)

**Q. 62**
[FAQ](#)
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Consider the following program segment used to execute on a hypothetical processor. Consider all the registers are of 16 bit size

*I<sub>1</sub>* MOV CX, 0005 ; CX ← 0005  
*I<sub>2</sub>* MOV BX, 0xFF7H ; BX ← 0xFF7H  
*I<sub>3</sub>* MOV AX, 0xBCAH ; AX ← 0xBCAH  
*I<sub>4</sub>* OR BX, AX ; BX ← BX (OR) AX  
*I<sub>5</sub>* AND DX, AX ; DX ← DX (AND) AX  
*I<sub>6</sub>* LOOP *I<sub>3</sub>* ; LOOP till CX = 0

Processor clock frequency is 1 MHz. In which data transfer operations takes 6 cycles, data manipulation operations takes 4 cycles and transfer of control operations takes 2 cycles to execute. How much time is required to execute the program (in  $\mu$ sec)?

**92**
[Correct Option](#)
**Solution :**

92

<i>I<sub>1</sub></i>	6 cycles
<i>I<sub>2</sub></i>	6 cycles
Label <i>I<sub>3</sub></i>	6 cycles
<i>I<sub>4</sub></i>	4 cycles
<i>I<sub>5</sub></i>	4 cycles
<i>I<sub>6</sub></i>	2 cycles

5 times

**Example:**

Time = 12 cycles + 80 cycles = 92 cycles

$$\text{Cycle time} = \frac{1}{1 \text{ MHz}} \text{ sec} = 1 \mu\text{sec}$$

 Program execution time = 92 cycles × 1  $\mu$ sec = 92  $\mu$ sec

[QUESTION ANALYTICS](#)

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


Consider the following function:

```

void madeeasy (int n)
{
    enqueue (Q, 0);
    enqueue (Q, 1);
    for(i = 0; i < n; i++)
    {
        x = dequeue (Q);
        y = dequeue (Q);
        enqueue (Q, y);
        enqueue (Q, x + y);
        print(x);
    }
}
    
```

What is the functionality of above function madeeasy?

A Prints numbers from 0 to  $n - 1$ .

B Prints numbers from  $n - 1$  to 0.

**C** Prints first  $n$  Fibonacci numbers.

Correct Option

**Solution :**

(c)

The function prints first  $n$  Fibonacci numbers. Note the 0 and 1 are initially there in the queue. This is the initial condition, for Fibonacci series. In every iteration of loop, sum of two queue items is enqueueued and the front item is dequeued i.e., sum of previous 2 numbers as in Fibonacci series.

**D** Prints first  $n$  Fibonacci numbers in reverse order.

QUESTION ANALYTICS



Q. 64

Solution Video

Have any Doubt ?



Consider two relations enrolled and course as shown below:

Enrolled		
Sid	Cid	Fees
S1	C1	10
S1	C2	20
S2	C3	30
S3	C4	40

Course		
Cid	Cname	Dept
C1	ALGO	CS
C2	DS	CS
C3	TOC	CS
C4	THERMO	ME

$\pi_{\text{Sid}, \text{Cid}}(\text{Enrolled}) / \pi_{\text{Cid}}(\sigma_{\text{Dept} = 'EE'}(\text{Course}))$ .

If above relational algebra query executes over above data base table, then how many tuples are there in the result of query?

**A** 2

Correct Option

**B** 3

**Solution :**

(b)

$|\pi_{\text{Cid}}(\sigma_{\text{Dept} = 'EE'}(\text{Course}))| = 0$   
 $\pi_{\text{Sid}, \text{Cid}}(\text{Enrolled}) / \pi_{\text{Cid}}(\text{empty tuples in Dept})$   
All the distinct Sid will be in the result.

**C** 4

**D** 5

QUESTION ANALYTICS



Q. 65

FAQ Solution Video

Have any Doubt ?



Consider the following statements:

I. Let  $T$  be a minimum spanning tree of a graph  $G$ . Then for any two vertices  $u$  and  $v$  the path from  $u$  to  $v$  in  $T$  is the shortest path from  $u$  to  $v$  in the graph  $G$ .

II. Suppose that average edge weight for a graph  $G$  is  $A_{\text{avg}}$ . Then the minimum spanning tree of  $G$  will have weight at most  $(n - 1) A_{\text{avg}}$ . Where  $n$  is number of vertices in graph  $G$ .

Which of the above statements are true?

**A** Only I

**B** Only II

**C** Both I and II

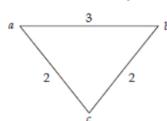
**D** None of these

Correct Option

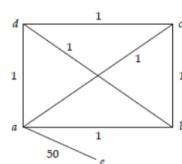
**Solution :**

(d)

I. MST contain  $ac$  and  $bc$  but not contain  $ab$ , which is the shortest path between  $a$  and  $b$ .



II. We may be forced to select the edges with weight much higher than average.



$$\text{Average weight} = \frac{50 + 6}{7} = 8$$

$$\text{Expected MST weight} = 4 \times 8 = 32$$

$$\text{Actual MST weight} = 50 + 6 = 56$$

Item 61-65 of 65 [« previous](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [next »](#)