



Ashima Garg

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FULL SYLLABUS TEST-4 (BASIC LEVEL) GATE 2019 - REPORTS

OVERALL ANALYSIS

COMPARISON REPORT

SOLUTION REPORT

ALL(65)

CORRECT(34)

INCORRECT(13)

SKIPPED(18)

Q. 1

Which of the following options is the closest to the meaning of the word INCORRIGIBLE?

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

A

Incapable of being corrected

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

(a)

B

Not clear enough to be read

C

Impossible to understand

D

Incapable of being forgotten

QUESTION ANALYTICS

Q. 2

Choose the most appropriate word from the options given below to complete the sentence: Catching the earlier bus will give me the _____ to go to the theatre and watch the latest movie.

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

A

fortune

B

occasion

C

chance

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

(c)

D

probability

QUESTION ANALYTICS

Q. 3

Choose the best alternative which can be substituted for the given sentence "A person who insists on something"

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 B
 Snob

 C
 Verbose

 D
 Stickler

Your answer is Correct

Solution :
 (d)

QUESTION ANALYTICS

Q. 4

How many 3-digit numbers are divisible by 7?

Solution Video | Have any Doubt ?

 A
 108

 B
 112

 C
 116

 D
 128

Your answer is Correct

Solution :
 (d)

The first 3 digit number divisible by 7 is 105 and last is 994.

This is an A.P. with $a = 105$, $d = 7$, $l = 994$

$$\begin{aligned} \text{nth term of A.P. } &= t_n = a + (n - 1)d \\ \Rightarrow & 994 = 105 + (n - 1)7 \\ \Rightarrow & 889 = 7(n - 1) \\ \Rightarrow & n - 1 = 127 \\ \therefore & n = 128 \end{aligned}$$

QUESTION ANALYTICS

Q. 5The remainder when $10^{50} - 7$ is divided by 3 is _____.

Solution Video | Have any Doubt ?

0

Correct Option

Solution :
 0

$$10^{50} - 7 = (10^{50} - 1) - 6$$

Then number $10^{50} - 1 = 99 \dots 9$ (49 digits)

Hence it is divisible by 3.

Thus $(10^{50} - 1) - 6$ when divided by 3 gives remainder of 0.



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Q. 6

Jayesh gave Karan a 5 m head start in a 100 m race and Jayesh was beaten by 0.25 m. In how many meters more would Jayesh have overtaken Karan?

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

A

4.75 m

Your answer is Wrong

B

5.00 m

C

5.25 m

Correct Option

Solution :

(c)

Jayesh covered $100 \text{ m} - 0.25 \text{ m} = 99.75 \text{ m}$ and Karan covered $100 \text{ m} - 5 \text{ m} = 95 \text{ m}$ (in the same interval).

Initial distance between them was 5 m and final distance between Jayesh and Karan was 0.25 m. Thus Jayesh gained $99.75 \text{ m} - 95 \text{ m} = 4.75 \text{ m}$ over Karan in 99.75 m, hence Jayesh is gaining

over Karan in every $\frac{99.75}{4.75} = 21 \text{ m}$.

Hence, Jayesh in order to gain remaining 0.25 m over Karan should cover $21 \times 0.25 = 5.25 \text{ m}$

D

5.50 m

QUESTION ANALYTICS

Q. 7

Each of the tomatoes in 10 kg of tomatoes is composed of 99% water, by weight. After some of the water evaporates, the tomatoes are now 98% water by weight. What is the new weight of the tomatoes, in kg?

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

A

0.2 kg

B

5 kg

Correct Option

Solution :

(b)

Before evaporation, 10 kg tomatoes = 9.9 kg water + 0.1 kg tomato matter

After evaporation, lets say the weight of tomatoes is x kg

$$x = \left(\frac{98}{100} \times x \right) \text{kg water} + 0.1 \text{ kg tomato matter}$$

Solving for x gives 5 kg.

C

9.2 kg

D

9.6 kg

QUESTION ANALYTICS



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Ram and Laxman have 194 pen drives between them. They sell at different prices but get the same amount. If Ram sells at Laxman's price and Laxman sells at Ram's price, they get ₹16875 and ₹1452 respectively. How many pen drives does Ram have?

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

A

48

B

150

Correct Option

Solution :

(b)

Let Ram have 'a' number of Pen drives and the price be ₹ x/unit.

Let Laxman have 'b' number of pen drives and the price be ₹ y/unit.

$$\begin{aligned} ax &= by \\ \Rightarrow \frac{x}{y} &= \frac{b}{a} \\ ay &= 16875 \text{ and } bx = 1452 \\ \Rightarrow \left(\frac{b}{a}\right)\left(\frac{x}{y}\right) &= \frac{1452}{16875} = \left(\frac{22}{75}\right)^2 \\ \Rightarrow \left(\frac{b}{a}\right)^2 &= \left(\frac{22}{75}\right)^2 \\ \Rightarrow b &= 44, a = 150 \end{aligned}$$

(Given $a + b = 194$)

C

96

D

124

QUESTION ANALYTICS**Q. 9**

One third of a consignment was sold at a profit of 10% and remainder was sold at a profit of 4%. If total profit was ₹ 1200, then the value (in ₹) of consignment is

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

A

20,000

Correct Option

Solution :

(a)

Let 'x' be the value of consignment

$$\begin{aligned} \Rightarrow \text{Profit} &= \frac{x}{3} \times \frac{10}{100} + \frac{2x}{3} \times \frac{4}{100} = 1200 \\ \Rightarrow x &= ₹ 20,000 \end{aligned}$$

B

22,000

C

16,000

D

12,000



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Q. 10

Three identical inlet pipes were opened at 6:00 AM to fill up an empty container. At 8:30 AM, 2 identical pipes (having different rate from existing pipe's rate) are also opened. At 9:30 AM, it still required 1 more hour for all these pipes to fill up the remaining 30 m^3 of water. If each of the 2 pipes which were added at 8:30 AM can individually fill up the empty container in 40 hours, then the capacity of the container is _____ m^3 .

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

120

Correct Option

Solution :

120

Let x and y be the rate of flow of the 2 sets of pipes in m^3 per hour.

We can write the following equations based on the given data :

$$3.5 \times 3 \times x + 1 \times 2 \times y + 30 = 40y$$

$$\text{and} \quad 3x + 2y = 30$$

Solving the two equations given above, we can calculate $x = 8$ and $y = 3 \text{ m}^3$ per hour

Hence, the capacity of the container $= 40 \times y = 120 \text{ m}^3$.

Alternatively,

$$\left(3.5 \times \frac{3}{x}\right) + \frac{2}{40} + \left(\frac{3}{x} + \frac{2}{40}\right) = 1$$

$$\Rightarrow x = 15 \text{ hours}$$

$$1 \text{ hour work} = \frac{3}{x} + \frac{2}{40} = \frac{1}{4}$$

$$\Rightarrow 30 \text{ m}^3 = \frac{1}{4} \text{ of container capacity}$$

$$\Rightarrow \text{Container capacity} = 120 \text{ m}^3$$

QUESTION ANALYTICS

Q. 11

Which of the following dependency problem can be eliminated by using register renaming?

[Have any Doubt ?](#) |

A

Data dependency

B

Anti dependency

Your answer is Correct

Solution :

(b)

To handle the anti-dependency problems Register Renaming is used.

C

Resource conflict

D

Structural dependency

QUESTION ANALYTICS

Q. 12

A page reference string is given below:



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A
First In First Out

B
Least recently used

C
Last In First Out

Your answer is Correct

Solution :

(C)

If there is 500 frame, fix 0 – 498 frame and vary only one frame this is the concept of Last In First Out.

D
None of the above

QUESTION ANALYTICS

Q. 13

A computer system has a cache with access time 10 ns, a hit ratio of 80% and average memory access time is 20 ns. Then what is the access time for physical memory?

[Have any Doubt ?](#)

A
50 ns

Your answer is Correct

Solution :
(a)

$$\begin{aligned}
 T_{avg} &= HT_c + (1 - H) (T_m + T_c) \\
 20 &= (0.8 \times 10) + (1 - 0.8) (x + 10) \\
 20 &= 8 + 0.2x + 2 \\
 0.2x &= 10 \\
 x &= 50 \text{ ns}
 \end{aligned}$$

B
40 ns

C
30 ns

D
20 ns

QUESTION ANALYTICS

Q. 14

Consider the following statements given below:

S₁: Round Robin scheduling algorithm always give better performance compared to first come first serve scheduling algorithm.

S₂ : An advantage of system call is to provide an interface between running program and operating system.
Which of the above statements is/are incorrect?

[Have any Doubt ?](#)

A
Only S₁

Correct Option



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burst time or processes. Then, it will work as FCFS only. Hence, this is not always true that RR give better performance compared to FCFS. S₁ incorrect
 S₂: An advantage of system call to provide the interface between program and operating system
 S₂ correct

B

Only S₂

C

Both S₁ and S₂

Your answer is Wrong

D

Neither S₁ nor S₂

QUESTION ANALYTICS

Q. 15

A particular parallel program computation requires 100 seconds when executed on a single processor. If 40 percent of this computation is 'inherently sequential', then what are the theoretically best elapsed times for this program running with 2 and 4 processors, respectively?

Have any Doubt ?

A

20 and 10 seconds

B

30 and 15 seconds

C

50 and 25 seconds

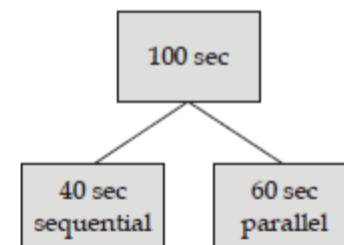
D

70 and 55 seconds

Your answer is Correct

Solution :

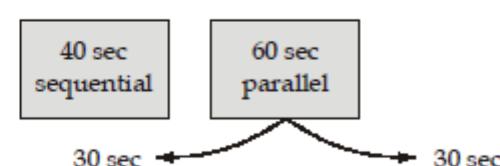
(d)



Take a single processor which requires 100 seconds for computation. It's 40 sec computation done sequentially.

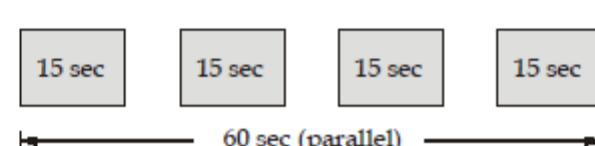
⇒ 60 sec computation is done parallel.

If 2 processors are used



Here maximum elapsed time = (40 + 30)sec = 70 sec.

If 4 processors are used



Here maximum elapsed time = (40 + 15)sec = 55 sec.



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- B
 LL(1) parser

- C
 Operator precedence parser

Your answer is Correct

Solution :

(c)
 Operator precedence parser is bottom up parser.
 Recursive descent and LL(1) is top down parser.

- D
 Both (a) and (c)

QUESTION ANALYTICS

Q. 19
 Let the eigen values of matrix $[A]_{2 \times 2}$ are γ and δ , then eigen values of $(A + 7I)^{-1}$ are

Have any Doubt ?

- A
 $(\gamma + 7), (\delta + 7)$

- B
 $\frac{1}{\gamma} + 7, \frac{1}{\delta} + 7$

- C
 $\frac{1}{\gamma+7}, \frac{1}{\delta+7}$

Your answer is Correct

Solution :

(c)
 Eigen values of $(A + 7I)$ are $\gamma + 7$ and $\delta + 7$

 $\text{Eigen values of } (A + 7I)^{-1} = \frac{1}{\gamma+7} \text{ and } \frac{1}{\delta+7}$

- D
 Can't be determined

QUESTION ANALYTICS

Q. 20

Let L be a language over any arbitrary alphabet and L' be its complement. Which one of the following is NOT a viable possibility?

Have any Doubt ?

- A
 Neither L nor L' is recursively enumerable (r.e.)

- B
 One of L and L' is r.e. but not recursive; the other is not r.e.

- C
 Both L and L' are r.e. but not recursive



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The set of recursive languages are closed under complementation. So if L/L' is recursive, same will be the fate of L'/L . So if one of them is recursive, then the other will follow the suit. This makes option (d) a viable possibility.

Let's now talk about option A. Option (a) is possible in case L or L' is a non RE (Recursive Enumerable) language, as the complement of a non RE language may be non RE, therefore also is a viable possibility.

(b) is also a well known possibility - because of a theorem which says "If both L and L' are REC, then L will be recursive". The corollary of this theorem says that "The complement of a language that is RE but not REC will be a non RE language." Therefore (b) is also viable.

(c) is not possible because of the corollary discussed above, quoted here again - if both L and L' are RE, then L will surely be REC. But option (c) says otherwise. Hence (c) is not a viable possibility. Hence (c) is the most appropriate choice.

D

Both L and L' are recursive

QUESTION ANALYTICS

Q. 21

Consider the following first order formulae:

- I. $\neg\forall x(P(x))$
- II. $\neg\exists x(P(x))$
- III. $\neg\exists x(\neg P(x))$
- IV. $\exists x(\neg P(x))$

Which of the above formulae are equivalent?

[Have any Doubt ?](#)

A

I and III only

B

I and IV only

Your answer is Correct**Solution :**

(b)

I and IV are equivalent. If $P(x)$ is not true for all x , it means that, then there's at least one x for which $P(x)$ is false.

C

II and III only

D

II and IV only

QUESTION ANALYTICS

Q. 22

Consider the following statements:

The horizontal microinstruction has

1. Longer control word than vertical microinstruction.
2. High degree of parallelism.
3. Slower execution than vertical microinstruction.

Which of these statements is/are correct?

[Have any Doubt ?](#)

A

1 only



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C

1 and 2 only

Your answer is Correct

Solution :

(c)

Horizontal microstructure has:

(a) 1 bit/control signal (longer control word).

(b) Little encoding (faster).

(c) High degree of parallelism (more than 1 control signal enabled at a time).

D

2 and 3 only

QUESTION ANALYTICS

Q. 23

Given 2 sets (a list of elements which is sorted is called as a set) P and Q of size m and n as input, the time complexity of the most efficient algorithm which outputs $P \cup Q$ in sorted form, where \cup denotes the union operation is equal to

Have any Doubt ?

A

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

B

 $O(m + n)$

Your answer is Correct

Solution :

(b)

Merge algorithm can be used to find the union sorted array in $O(m + n)$ time.

C

 $O(m \log n)$

D

 $O(m^2 + n^2)$

QUESTION ANALYTICS

Q. 24

A sorting algorithm is said to be stable if the relative order of keys is the same after the sort as it was before the sort. In which of the following pairs both sorting algorithms are stable?

Have any Doubt ?

A

Quick sort and insertion sort

B

Insertion sort and Bubble sort

Your answer is Correct

Solution :

(b)

Insertion and bubble sort are stable sorting algorithms. Quick Sort and Heap sort are unstable.

C

Quick sort and Heap sort



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QUESTION ANALYTICS

Q. 25

The subset-sum problem is defined as follows. Given a set of n positive integers, $S = \{a_1, a_2, a_3, \dots, a_n\}$ and positive integer W , is there a subset of S whose elements sum to W ? A dynamic program for solving this problem uses a 2-dimensional Boolean array X , with n rows and $W + 1$ columns.

$X[i, j], 1 \leq i \leq n; 0 \leq j \leq W$ is TRUE, if and only if there is a subset of $\{a_1, a_2, \dots, a_i\}$ whose elements sum to j . Which of the following is valid for $2 \leq i \leq n$ and $a_i \leq j \leq W$?

A

$$X[i, j] = X[i - 1, j] \vee X[i, j - a_i]$$

B

$$X[i, j] = X[i - 1, j] \vee X[i - 1, j - a_i]$$

Your answer is Correct

Solution :

(b)

C

$$X[i, j] = X[i - 1, j] \wedge X[i, j - a_i]$$

D

$$X[i, j] = X[i - 1, j] \wedge X[i - 1, j - a_i]$$

QUESTION ANALYTICS

Q. 26

In TCP client sends 4 segments each of 200 bytes to a server with a sequence number starting from 200. All the segments reached successfully except third segment. The acknowledgment number expected from the server is _____.

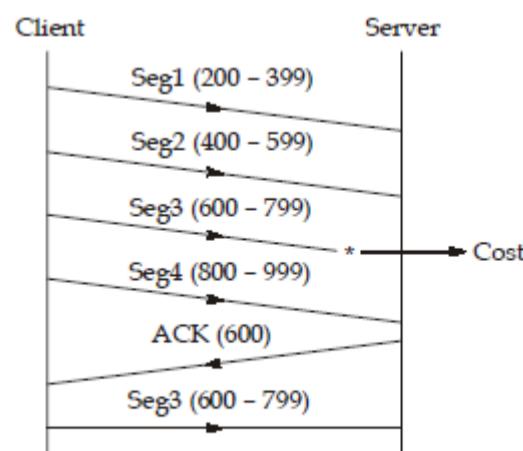
600

Your answer is Correct 600

Solution :

600

In TCP, ACK = next byte expected.



So, acknowledgment number 600 will be received from the server.

QUESTION ANALYTICS



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Minimum number of relations required to convert ER diagram to relational database _____.

[Have any Doubt ?](#)

4

Correct Option

Solution :

4

 $E_1(A, B, C) \dots (1)$ $E_2(D, E)$

Here E is a multivalued attribute

 $E_{21}(D, F) \dots (2)$ $E_{22}(D, E) \dots (3)$ $E_3(AD) \dots (4)$

Total 4 relations required.

Your Answer is 3

QUESTION ANALYTICS

Q. 28

Consider a relation R(A, B, C, D, E) with functional dependencies:

 $F = \{AB \rightarrow C, CD \rightarrow E, C \rightarrow A, C \rightarrow D, D \rightarrow B\}$

Number of candidates key in above relation R is _____.

[Have any Doubt ?](#)

3

Correct Option

Solution :

3

 $R(A, B, C, D, E)$ Closure of $(AB)^+$ = {A, B, C, D, E}

AB is a candidate key.

Closure of $(C)^+$ = {C, A, D, E, B}

C is a candidate key.

Closure of $(AD)^+$ = {A, D, B, C, E}

AD is a candidate key.

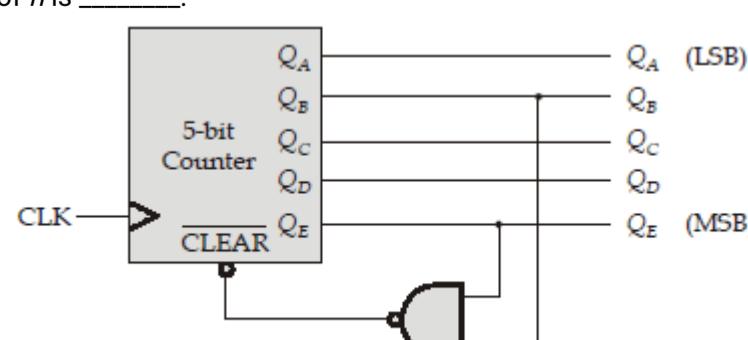
Total 3 candidate key for relation R.

Your Answer is 2

QUESTION ANALYTICS

Q. 29

A mod-n binary counter is designed using a synchronous up-counter as shown in the figure below. The value of n is _____.





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Solution :

18

Clear signal is $\overline{Q_B \cdot Q_E}$ Counter is cleared when $(Q_E Q_D Q_C Q_B Q_A) = (10010)$

So, MOD of the counter is 18 as it counts states from 0 to 17.

Your answer is **Correct18**

QUESTION ANALYTICS

Q. 30

Consider the following problems on decidability:

- I. Given a CFG G and a string $w \in \Sigma^*$, does w belong to $L(G)$?
- II. Given a Turing Machine T, a string $w \in \Sigma^*$ and an integer k , does T accept w within k steps?
- III. Given a Turing Machine T, a string $w \in \Sigma^*$ and a state $q \in Q$ (set of states of the Turing Machine) does the computation of T on w visit the state q ?

The total number of decidable problems are _____.

Have any Doubt ?

2

Your answer is **Correct0****Solution :**

2

I is the membership problem for CFLs, for which we have the CYK algorithm. Therefore decidable.

II is decidable because we can simulate the Turing Machine T on w for k steps and check whether T comes to a halt or not. Therefore II is decidable.

III is the well known state entry problem, which is undecidable.

QUESTION ANALYTICS

Q. 31

The maximum number of possible edges in an undirected graph with 10 vertices and 5 components is _____.

Have any Doubt ?

15

Your answer is **Correct15****Solution :**

15

Max number of edges in a graph with n vertices, k components = $\frac{(n-k)(n-k+1)}{2}$

10 vertices, 5 components = $\frac{(10-5)(10-5+1)}{2} = 15$

QUESTION ANALYTICS

Q. 32

The probability of getting at least 3 consecutive heads in 4 tosses of a fair coin is equal to _____. (answer upto 2 decimal places)

Have any Doubt ?



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Solution :

0.1875 (0.18 - 0.20)

Favourable cases: HHHH, HHHT, THHH = 3**Total cases:** $2^4 = 16$

$$\text{Probability} = \frac{3}{16}$$

QUESTION ANALYTICS**Q. 33**

Given are 2 sequences S_1 and S_2 respectively as $S_1 = \text{"ABCDGH"}$ and $S_2 = \text{"AEDFHR"}$. The length of the longest common subsequence present in both S_1 and S_2 will be _____.

3

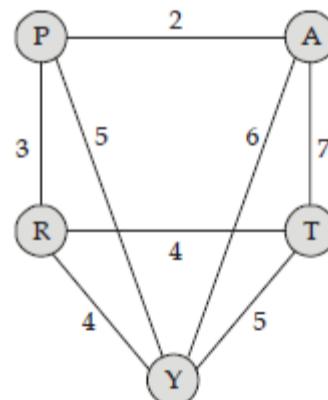
Your answer is **Correct** 3**Solution :**

3

The longest common subsequence is "ADH" and therefore the length of the LCS will be equal

QUESTION ANALYTICS**Q. 34**

Assume Dijkstra's algorithm is used to find the shortest paths from node 'P' in the following graph.



The number of edges which are not included in any of the shortest paths from node 'P' is equal to _____.

4

Correct Option**Solution :**

4

Edges not included in any shortest path from node 'P':

(R, Y)

(Y, T)

(Y, A)

and (A, T)

QUESTION ANALYTICS**Q. 35**

Let the function $f(x) = x^2 - 32\sqrt{x}$

$S_1 : f$ is increasing for $x > 4$.



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2

Correct Option

Solution :

2

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

For $0 < x < 4$:Put any point less than 4 say $x = 1$; $f'(1) = -14 < 0$, so $f(x)$ is decreasing.**For $x > 4$:**Put any point more than 4 say $x = 5$; $f'(5) = \frac{2(5^{3/2} - 8)}{\sqrt{5}} > 0$, so $f(x)$ is increasing.**For $x < 0$:** $f(x)$ is undefined.

Therefore number of correct statements = 2.

QUESTION ANALYTICS

Q. 36

Consider the below statements about Internet Protocol (IP) and Medium Access Control (MAC).

- I. IP packets from the same source to the same destination can take different routes in the network.
 - II. A computer can have multiple MAC addresses.
 - III. A computer can have multiple IP addresses at different instance of time.
- Which of the above is true?

[Have any Doubt ?](#)

A

I and II only

B

I and III only

Your answer is Wrong

C

II and III only

D

All of the above

Correct Option

Solution :

(d)

All of the above statements are true.

- Packets can take different routes for same destination in packet switching.
- A computer can have multiple MAC address to support fault tolerance.
- At different time computer IP addresses changes.

QUESTION ANALYTICS

Q. 37

Consider the following solution to the critical-section problem for two process.

boolean flag [2];**int turn;**



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```

flag [i] = true;
while (flag [j]) {
    if (turn == i)
    {
        flag [i] = TRUE;
        while (turn == j);
        flag [i] = TRUE;
    }
}
CRITICAL SECTION
turn = j;
flag [i] = FALSE;
remainder section
}
while (1);
  
```

Two process P_0 and P_1 share the flag and turn variable. The structure of the process P_i ($i = 0$ or 1), with P_j ($i = 1$ or 0) being the other process.

If the initial value of turn is 0, which of the following is TRUE, about the above solution?

A

The proposed solution fails to guarantee mutual exclusion.

B

This solution guarantees mutual exclusion and prevent deadlock.

C

This solution fails to prevent deadlock.

Solution :

(c)

This solution can not prevent deadlock.

Initial value of turn is 0 both processes currently executing this code segment. Both process P_0 and P_1 make $\text{flag}[i] = \text{true}$. Process P_1 stuck in while loop and process P_0 after executing the while loop can not enter into critical section. This is a deadlock condition.

D

This solution fails to guarantee mutual exclusion and fails to prevent deadlock.

QUESTION ANALYTICS**Q. 38**

Consider two computers A and B are connected through a network of 30 Mbps. Assume the distance between them is 3000 km and the signal propagation speed is same as the speed of light and the packet size is 12 KB. What is the minimum number of bits required for window to achieve 100% utilization during GoBack-N and selective repeat protocol?

A

5 and 6

B

6 and 7

Solution :

(b)

$$\text{Propagation Time } (T_p) = \frac{3000 \times 10^3 \text{ m}}{3 \times 10^8 \text{ m/s}} = 10 \text{ msec}$$

$$\text{Round Trip Time (R.T.T.)} = 2 \times T_p = 20 \text{ msec}$$



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$$= \frac{30 \times 20}{12} = 50$$

	Sequence	Number of bits
GBN	$W + 1 = 50 + 1 = 51$	$\lceil \log_2(51) \rceil = 6$
SR	$2W = 2 \times 50 = 100$	$\lceil \log_2(100) \rceil = 7$

Hence option (b) is correct.

C

6 and 6

D

7 and 8

QUESTION ANALYTICS

Q. 39

Consider the following CFG:

$$E \rightarrow S a A \mid a S$$

$$S \rightarrow b A \mid A$$

$$A \rightarrow a A \mid a$$

(Where E, S, A are nonterminal and a, b are terminals) The above grammar is

Have any Doubt ?

A

LALR(1) but not SLR(1)

B

Not LALR(1) but CLR(1)

C

Only CLR(1)

D

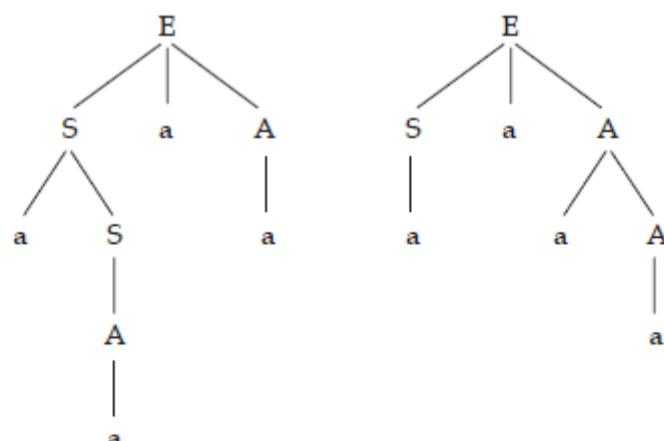
None of these

Correct Option

Solution :

(d)

Grammar is ambiguous aaaa can be generated with different parse tree:



So it can not parse by any of SLR(1), LALR(1) and CLR(1).
 So correct option is (d).

QUESTION ANALYTICS

Q. 40

Consider the following translation scheme:

$$S \rightarrow A - B$$



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D → id {print(id.value);}

Here id is a token that represent an integer and id.value represent the corresponding integer value.
 For the input $5 + 4 * 8 - 3 + 4$, this translation scheme prints?

[Have any Doubt ?](#)

A

 $54 + * 83 * + 4 + *$

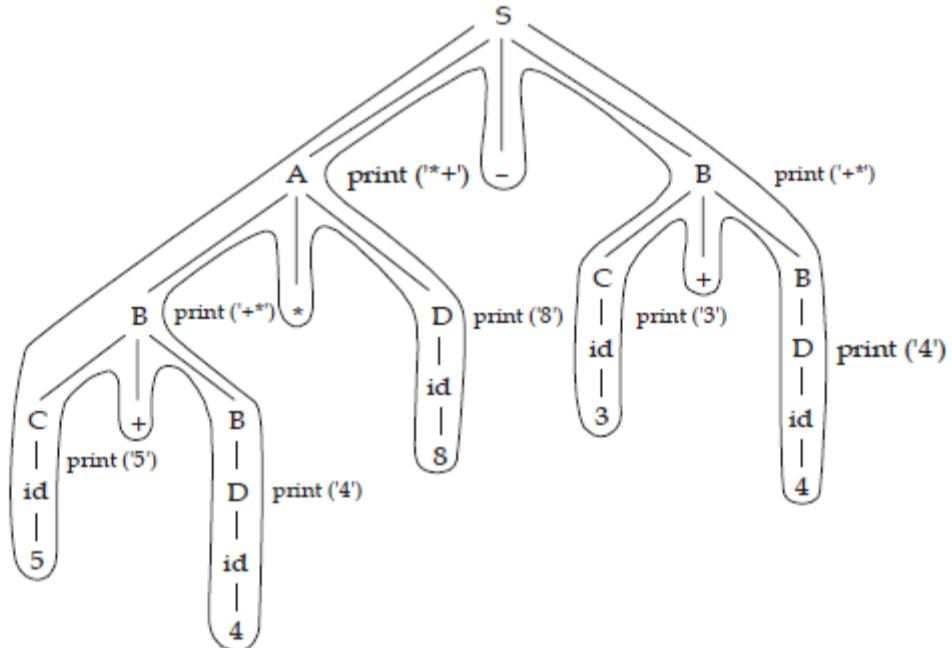
B

 $54 + * 8 * + 34 * +$

C

 $54 + * 8 * + 34 + *$ Your answer is **Correct****Solution :**

(c)

 $5 + 4 * 8 - 3 + 4$ **Syntax tree for this input**It will print $54 + * 8 * + 34 + *$

So option (c) is correct.

D

 $54 + * 83 * + 34 + *$ **QUESTION ANALYTICS****Q. 41**

Consider a graph G with writes a, b, e, f, g, h in the form of adjacency matrix representation as shown below:

	<i>a</i>	<i>b</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>
<i>a</i>	0	1	1	1	0	0
<i>b</i>	1	0	0	0	0	1
<i>e</i>	1	0	0	0	1	0
<i>f</i>	1	0	0	0	1	1
<i>g</i>	0	0	1	1	0	1
<i>h</i>	0	1	0	1	1	0

Assume that the DFS algorithm is applied on G, with 'a' as the starting vertex. Consider the following traversal sequences.

- $a \rightarrow g \rightarrow h \rightarrow b \rightarrow f$
- $a \rightarrow e \rightarrow g \rightarrow h \rightarrow f \rightarrow b$
- $a \rightarrow e \rightarrow f \rightarrow b \rightarrow g \rightarrow h$
- $a \rightarrow e \rightarrow g \rightarrow f \rightarrow h \rightarrow b$

The correct DFS sequences when executed on G are

[Have any Doubt ?](#)

A



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I, II and III only

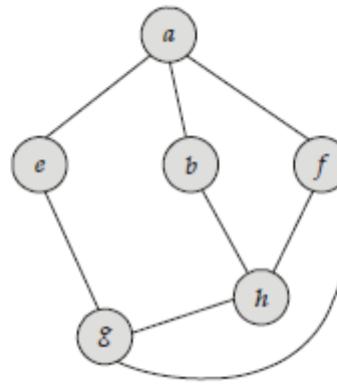
C
II, III and IV onlyD
I, II and IV only

Your answer is Correct

Solution :

(d)

The graph corresponding to the given adjacency matrix is as follows:



So, we can easily see that I, II and IV will be correct DFS sequences, but III won't be.
 So option (d) is the correct answer.

QUESTION ANALYTICS

Q. 42Let prefix(w) denote the set of all prefixes of a string(w).Let suffix(w) denote the set of all suffixes of (w).Similarly let substring(w) denote the set of all substrings of string(w).

Consider the following statements: is/are true?

- prefix(w) \cup suffix(w) = substring(w)
- prefix(w) \cap suffix(w) = $\{\epsilon, w\}$

Which of the above statements is/are true?

Have any Doubt ?

A

I and II only

B

I only

C

II only

D

None of these

Correct Option

Solution :

(d)

Let

$$w = 11011$$

$$\text{prefix}(w) = \{\epsilon, 1, 11, 110, 1101, 11011\}$$

$$\text{suffix}(w) = \{\epsilon, 1, 11, 011, 1011, 11011\}$$

$$\text{prefix}(w) \cap \text{suffix}(w) = \{\epsilon, 1, 11, 11011\}$$

\downarrow
 w

Clearly $\text{prefix}(w) \cap \text{suffix}(w) \neq \{\epsilon, w\}$

Hence I is false.

$$\text{prefix}(w) \cup \text{suffix}(w) = \{\epsilon, 1, 11, 110, 1101, 011, 1011, 11011\}$$

Note here, that in 11011, string 101 \in substring(w) but \notin [prefix(w) \cup suffix(w)]Hence $\text{prefix}(w) \cup \text{suffix}(w) \neq \text{substring}(w)$



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QUESTION ANALYTICS

Q. 43

Consider a 5 stage pipeline with Instruction Fetch (IF), Instruction Decode (ID), Execute (EX), Write Back (WB) and Memory Access (MA) having latencies (in ns) 3, 8, 5, 6 and 4 respectively. What is average CPI of non-pipeline CPU when speed up achieved by to pipeline is 4?

[Have any Doubt ?](#)**A**

1.33

B

1.76

C

1.14

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

(c)

$$\text{Speed up} = \frac{t_{\text{non-pipeline}}(n)}{t_{\text{pipeline}}(p)}$$

$$4 = \frac{\text{CPI}_n \times \text{Number of instruction} \times \text{cycle time}_n}{\text{CPI}_n \times \text{Number of instruction} \times \text{cycle time}_p}$$

$$4 = \frac{\text{CPI}_n \times (3+8+5+6+4)}{1 \times \max\{3, 8, 5, 6, 4\}} = \frac{\text{CPI}_n \times 32}{1 \times 8}$$

$$\text{CPI}_n = \frac{32}{28}$$

$$\text{CPI}_n = 1.14$$

D

1.66

QUESTION ANALYTICS

Q. 44

The probability of a man hitting a target in one fire is $\frac{1}{6}$. The number of times at least he must fire at the

target in order that his chance of hitting the target at least once will exceed $\frac{2}{5}$ will be

[Have any Doubt ?](#)**A**

1

B

2

C

3

Correct Option

Solution :

(c)

$$\text{Probability of hitting target} = \frac{1}{6}$$

$$\text{Probability of missing target} = \frac{5}{6}$$



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$$= 1 - \left(\frac{5}{6}\right)^n$$

$$1 - \left(\frac{5}{6}\right)^n > \frac{2}{5}$$

$$\left(\frac{5}{6}\right)^n < \frac{3}{5}$$

$$n > 2.8$$

$$n_{\text{least}} = 3$$

D

4

QUESTION ANALYTICS

Q. 45

A ball thrown vertically upward satisfies the equation $S = 160t - 20t^2$, where S is in meters and t is in seconds. What is the maximum height achieved by the ball?

Have any Doubt?

A

80

B

160

C

240

D

320

Your answer is Correct

Solution :

(d)

$$S = 160t - 20t^2$$

For maximum height

$$\frac{dS}{dt} = 160 - 40t = 0$$

and $t = 4$ sec

$$\frac{d^2S}{dt^2} = -40 < 0 \Rightarrow \text{Maxima}$$

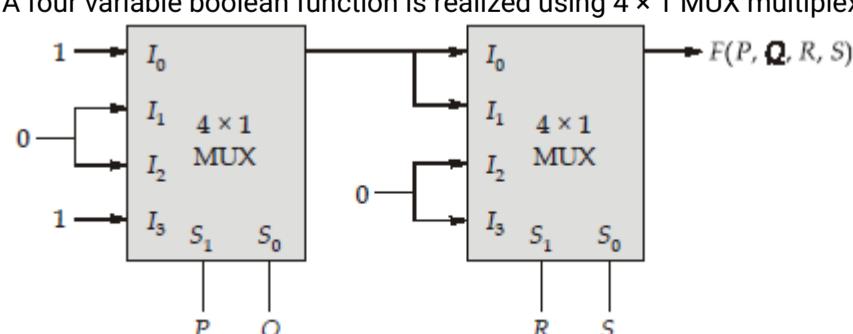
$$S_{\max} = 160 \times 4 - 20 \times 4^2$$

$$\text{Maximum height} = 320 \text{ m}$$

QUESTION ANALYTICS

Q. 46

A four variable boolean function is realized using 4×1 MUX multiplexers as shown in the figure:



The minimized expression for $F(P, Q, R, S)$ is



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(PQ + PQ) · R

B

(P̄Q + P̄Q)(R̄ + S̄)

C

(P̄Q + PQ) · R̄

Your answer is Correct

Solution :

(c)

Output of the first multiplexer can be expressed as F_1

$$F_1 = \bar{P}\bar{Q} + PQ$$

Output of the second multiplexer can be expressed as F

$$\begin{aligned} F &= \bar{R}\bar{S} \cdot F_1 + \bar{R}S \cdot F_1 \\ &= (\bar{P}\bar{Q} + PQ)(\bar{R}\bar{S} + \bar{R}S) \\ &= (P \odot Q) \cdot \bar{R} \\ &= (\bar{P}\bar{Q} + PQ)\bar{R} \end{aligned}$$

D

(P + Q) (R + S)

QUESTION ANALYTICS

Q. 47

Consider the following codes (List-I and List-II)

List-I

- A. Pointers
- B. Re-location of a program
- C. Constants accessing
- D. Linear array elements access

Codes:

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

List-II

- 1. Immediate AM
- 2. Auto indexed AM
- 3. Indirect AM
- 4. Relative AM

Have any Doubt ?



A

a

B

b

C

c

D

d

Correct Option

Solution :

(d)



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Consider the following statements with regards to the asymptotic behaviour of the functions:

- I. $f(n) = O(g(n))$ implies $g(n) = O(f(n))$
- II. $f(n) = \Theta(g(n))$ implies $g(n) = \Theta(f(n))$
- III. If $f(n) = O(g(n))$ and $g(n) = O(h(n))$, then $f(n) = O(h(n))$

Out of I, II and III, the statements which always hold true are:

[Have any Doubt ?](#)

A
I, II, III

B
II only

C
III only

Your answer is Wrong

D
II and III, but not I

Correct Option

Solution :

(d)

I is false, II and III are true, because I is not symmetric. For example,
 $n \in O(n^2)$, but $n^2 \notin O(n)$.

QUESTION ANALYTICS

Q. 49

We are given a simple undirected graph G which has m nodes and n edges, such that $m - n = 1$. The time complexity of the most efficient algorithm in the worst case to determine whether G is connected or not is equal to

[Have any Doubt ?](#)

A
 $\Theta(m \log n + n \log m)$

B
 $\Theta(m + n)$

Correct Option

Solution :

(b)

The condition can be simplified as, $n = m - 1$. i.e. the number of edges = number of vertices - 1. But this does not mean that G is a tree because even a disconnected graph can satisfy the given condition. So option (b) is the best possible answer as we will have to use BFS as we still don't know if the graph is connected or not.

C
 $\Theta(\max(m, n))$

D
None of these

Your answer is Wrong

QUESTION ANALYTICS

Q. 50

Consider the following undirected graph G:



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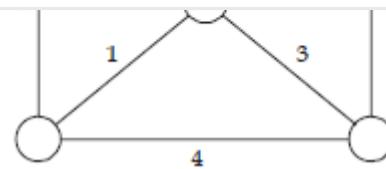
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 The smallest value of x for which the number of MSTs of G will be maximized is equal to

A

2

B

3

C

4

D

5

Solution :

(d)

$$x = 2, 3, 4; \text{ number of MSTs} = 2$$

$$x = 5; \text{ number of MSTs} = 2 \times 2 = 4$$

 Hence $x = 5$ will be the answer.

QUESTION ANALYTICS

Q. 51

Consider the following factorization of a matrix A.

$$A = LU, \text{ where } L = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 7 & 2 & 1 \end{bmatrix}_{3 \times 3}, U = \begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}_{3 \times 3} \text{ and } A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}_{3 \times 3}$$

 If $i = 1$ then $a_{ij} = j$ otherwise $a_{ij} = 3 + a_{(i-1)j}$. Find the matrix U.

A

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -2 \\ 0 & 0 & 0 \end{bmatrix}$$

B

$$\begin{bmatrix} 1 & 2 & -6 \\ 0 & -3 & 3 \\ 0 & 0 & 0 \end{bmatrix}$$

C

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & 0 \end{bmatrix}$$

Solution :

(c)

$$A = LU$$

Given

$$L = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 7 & 2 & 1 \end{bmatrix}$$



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$$\therefore \quad A = \begin{bmatrix} a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$a_{ij} = j, \text{ if } i = 1$$

$$= 3 + a_{(i-1)j}; \text{ otherwise}$$

$$\therefore \quad A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

$$A = LU$$

$$\Rightarrow \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 7 & 2 & 1 \end{bmatrix} \begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}$$

- (i) $a = 1$, (ii) $b = 2$ (iii) $c = 3$
- (iv) $4b + d = 5 \Rightarrow 4 \times 2 + d = 5 \Rightarrow d = -3$
- (v) $4c + e = 6 \Rightarrow 4 \times 3 + e = 6 \Rightarrow e = -6$
- (vi) $7c + 2e + f = 9 \Rightarrow 7 \times 3 + 2 \times (-6) + f = 9 \Rightarrow f = 0$

$$\therefore \quad U = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & 0 \end{bmatrix}$$

D

$$\begin{bmatrix} 1 & 2 & -6 \\ 0 & -1 & -6 \\ 0 & 0 & 0 \end{bmatrix}$$

QUESTION ANALYTICS

Q. 52

Consider the following C program:

```
#include <stdio.h>
#define black(a) a + a*a
#define white(a) a - a*a
int main(void)
{
    int a = 3;
    printf("%d", black(a)*black(a + 1) - white(a));
    return 0;
}
```

The output of the above program will be

Have any Doubt ?

A

25

B

26

Your answer is Correct

Solution :

(b)

The expression will evaluate to,

$$\begin{aligned}
 &= 3 + 3 * 3 * 3 + 1 + 3 + 1 * 3 + 1 - 3 - 3 * 3 \\
 &= 3 + (3 * 3 * 3) + 1 + 3 + (1 * 3) + 1 - 3 - (3 * 3) \\
 &= 3 + 27 + 1 + 3 + 3 - 2 - 9 \\
 &= 26
 \end{aligned}$$



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D

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[QUESTION ANALYTICS](#)
Q. 53

Consider the following bubble sort function.

```
bubblesort (A)
{
    for i ← 1 to length [A]
        do for j ← length [A] down to i + 1
            do if (X) then exchange A[j] ↔ A[j - 1]
}
```

What is the missing statement at X, if the bubble sort function is to be implemented correctly to sort the elements in the increasing order?

[Have any Doubt ?](#)

A

A[j] > A[j - 1]

Your answer is Wrong

B

A[j] < A[j - 1]

Correct Option

Solution :

(b)

If A[j] is smaller than A[j - 1] then exchange A[j] and A[j - 1] to get the smaller first.

C

A[j] = A[j - 1]

D

A[j] ≠ A[j - 1]

[QUESTION ANALYTICS](#)
Q. 54

A group of N stations share a 100 Kbps pure ALOHA channel. Each station outputs a 1000 byte frame on average once every 50 seconds. The maximum value of N is _____.

[Have any Doubt ?](#)

920

Correct Option

Solution :

920

The efficiency of pure ALOHA is 18.4%.
Hence the usable bandwidth = $0.184 \times 100 \text{ Kbps} = 18.4 \text{ Kbps}$
Each station sends 1000 byte in 50 seconds.
So, in 1 second each station sends 20 byte.

$$\text{So, } N = \frac{18.4 \times 10^3 B}{20 B}$$

$$N = 920$$

Your Answer is 115



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Q. 55

If a system has 32 KB memory and buddy system is used to allocate the memory for process during run time. Consider the following scenario.

- Process P_0 of size 14 KB loaded.
- Process P_1 of size 8 KB loaded.
- Process P_1 is terminated and space is available.
- Process P_2 of size 5 KB loaded.
- Process P_3 of size 6 KB loaded.

The space is wasted due to internal fragmentation _____ (in KB).

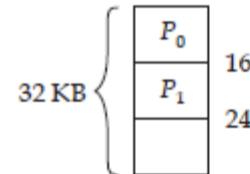
[Have any Doubt ?](#)

7

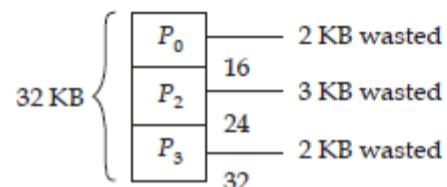
[Correct Option](#)
Solution :

7

Buddy system can allocate the space for every process only in power of 2.



Now P_1 terminated.



Total 7 KB memory is wasted due to internal fragmentation.

[QUESTION ANALYTICS](#)
Q. 56

Unix I-node has block size 8 KB and file possible with triple indirect is 128 GB. Number of bits disk block address contain is _____.

[Have any Doubt ?](#)

256

[Correct Option](#)
Solution :

256

Assume disk block address contain x bits.

Number of disk block pointer in one block

$$\begin{aligned}
 &= \frac{\text{Block size}}{\text{Block address size}} \\
 &= \frac{8 \text{ KB}}{x} = \frac{2^{16} \text{ bits}}{x \text{ bits}}
 \end{aligned}$$

Maximum file size due to triple indirect pointer = 128 GB

$$128 \text{ GB} = \left[\frac{2^{16}}{x} \right]^3 \times 8 \text{ KB}$$

$$2^{37} = \frac{2^{48}}{x^3} \times 2^{13}$$

$$x^3 = 2^{24}$$

$$x = 2^8$$

$$x = 256 \text{ bits}$$



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Q. 57

Consider the following code segment:

 $a = a * b$
 $c = a + b$
 $d = d/c$
 $c = b + d$
 $a = d + c$

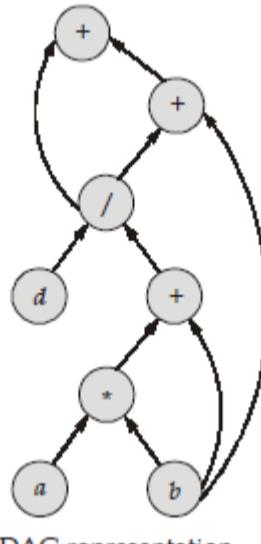
What will be the minimum number of nodes present in the Directed Acyclic Graph (DAG) representation of the above code _____.

[Have any Doubt ?](#)

8

 Your answer is **Correct** 8
Solution :

8



Total 10 edges and 8 nodes required in DAG.

QUESTION ANALYTICS

Q. 58

Consider a relation R(A, B, C, D, E) with the following dependencies:

 $F = \{A \rightarrow BC, C \rightarrow AE, B \rightarrow D, C \rightarrow B\}$

Maximum possible superkeys on relation R is _____.

[Have any Doubt ?](#)

24

Correct Option

Solution :

24

 $R(A, B, C, D, E)$

 Closure of (A^+) = {A, B, C, D, E}

 Closure of (C^+) = {A, B, C, D, E}

A and C are candidate keys of R

 Total number of possible superkeys with A = A and any combination of B, C, D, E = 2^4

 Similarly with C = 2^4

 Total number of superkeys = $2^4 + 2^4 - 2^3$
 $= 16 + 16 - 8 = 24$

Your Answer is 12

QUESTION ANALYTICS



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Catalog (sid,pid)

pid	pname	color
10	X	Red
15	Y	Red
20	Z	Green
25	A	White
30	B	Red
35	C	Green
40	X	Violet
45	D	Red
50	Y	Blue

Parts

sid	pid
1	10
2	10
1	20
3	20
4	30
4	40
3	10
1	25
5	20
6	45
5	45

Catalog

```

SELECT C.sid FROM Parts P, Catalog C
WHERE P.color = 'Red' AND P.pid = C.pid
AND EXISTS (SELECT P2.pid FROM Parts P2
Catalog C2 WHERE P2.color = 'Green' AND
C2.sid = C.sid AND P2.pid = C2.pid)
  
```

The number of tuples returned by the above SQL query is _____.

[Have any Doubt ?](#)

3

Correct Option

Solution :

3

SQL query return the sids of suppliers who supply some Red parts and some Green part. The following relation is return by the SQL query.

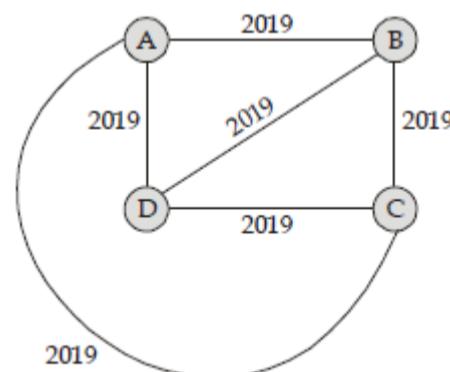
sid
1
3
5

Total 3 tuple returns.

QUESTION ANALYTICS

Q. 60

Consider the following graph G:



The total number of minimum cost spanning trees possible for G is equal to _____.

[Have any Doubt ?](#)

16

Your answer is Correct16

Solution :

16

If seen carefully, G is actually K_4 . Since every edge has same cost, G can be thought of an unweighted graph.Therefore number of spanning trees (K_n) = n^{n-2} Therefore number of spanning trees (K_4) = $4^{4-2} = 16$



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Q. 61

We define the powers of a string w over the concatenation operation (\cdot) as follows:

$$w^0 = \epsilon$$

$$w^{i+1} = w^i \cdot w$$

The number of states in the minimal DFA (over the unary alphabet $\{1\}$) of the language corresponding to the regular expression $(1^3 + 1^{2019})^* + (1^6 + 1^{2016})^*$ is equal to _____.

3

Correct Option

Solution :

3

The regular expression is $(1^3 + 1^{2019})^* + (1^6 + 1^{2016})^*$

Which is same as, $(1^3)^* + (1^6)^*$

$$= (111)^* + (111111)^*$$

$$= (111)^* [\text{as } (111)^* \text{ is a superset of } (111111)^*]$$

Which only requires 3 states.

QUESTION ANALYTICS**Q. 62**

Consider the following C function which adds a given node pointed by q at the tail of the linked list. (Note that the next pointer of the new node to be inserted is already initialized as NULL). Struct node * add (struct node * head, struct node * q)

```
{
  if (!head) return q;
  struct node * p = head;
  while (p->next != NULL)
    {
```

}

}

return head;

}

A person new to programming attempts to fill these boxes B_1 , B_2 , B_3 in ways as follows:

I. B_1 :

B_2 :

B_3 :

II. B_1 :

B_2 :

B_3 :

III. B_1 :

B_2 :

B_3 :

The number of correct ways of filling the boxes so that the implementation works correctly is equal to

2

Your answer is Correct!



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Only 1 and 11 will produce the expected output as 11 will go into infinite loop because of box D.
 Therefore 2 is the answer.

QUESTION ANALYTICS

Q. 63

Consider the following function A(m, n):

```
int A(int m, int n)
{
    if (m == 0) return (n + 1);
    if (n == 0) return A(m - 1, 1);
    return A(m - 1, A(m, n - 1));
}
```

The output corresponding to A(1, 7) will be _____.

Have any Doubt?

9

Your answer is Correct!

Solution :

9

$$\begin{aligned} A(1, 1) &= A(0, A(1, 0)) \\ &= A(0, A(0, 1)) \\ &= A(0, 2) = 3 \end{aligned}$$

$$\begin{aligned} \text{Similarly, } A(1, 2) &= 4 \\ A(1, 3) &= 5 \\ A(1, 4) &= 6 \\ &\vdots \\ A(1, 7) &= 9 \end{aligned}$$

QUESTION ANALYTICS

Q. 64For a given language L over $(0, 1)^*$, we define the operation init(L) as, $\text{init}(L) = \{u \mid uv \in L \text{ for some } v \in \{0, 1\}^*\}$ Let $L_1 = \{w \mid w \in (0, 1)^*, n_0(w) = n_1(w)\}$. Let X denote the language accepted by $\text{init}(L_1)$. Then the number of states in the minimal DFA of X is equal to _____.

Have any Doubt?

1

Correct Option

Solution :

1

The thing to note here is that, $\text{init}(L_1) = (0 + 1)^*$ Therefore for $(0 + 1)^*$, we only need one state - that too a permanent accepting state.

Therefore the minimal DFA has only 1 state.

QUESTION ANALYTICS

Q. 65Consider the following first order logic statements, where $P(x)$ and $Q(x)$ are predicates.

$$\text{I. } \forall x(P(x) \wedge Q(x)) \Rightarrow \forall xP(x) \wedge \forall xQ(x)$$



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The number of correct statements are _____.

[Have any Doubt ?](#)

4

Correct Option**Solution :**

4

Since \forall is fully distributive over \wedge , I and II are true. Similarly \exists is fully distributive over \vee , which makes III and IV true as well.

Therefore all are true and 4 is the answer.

Your Answer is 2[QUESTION ANALYTICS](#)