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Computer Science Engineering(CS)

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FULL SYLLABUS TEST-5 (ADVANCE LEVEL) GATE 2019 - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(65) | CORRECT(22) | INCORRECT(24) | SKIPPED(19)

Q. 1

Choose the word which is least like "REMISS"

Solution Video | Have any Doubt ?

A Careless — Your answer is **Wrong**

B Harmful

C Dutiful — Correct Option

Solution :
(c)
The meaning of the word REMISS is lacking care or attention to duty; negligent.

D Forgetful

QUESTION ANALYTICS +

Q. 2

You are provided with two sentences, in each of them two words are missing. You are given four options suggesting pair of words that together can make each of the sentences coherent and complete. Identify the correct pair.
1. The Cassini-Huygens satellite, commonly called Cassini, which has been _____ Saturn these past 15 years, will destroy itself on 7th October by taking a _____ into the ringed planet's atmosphere.
2. For people more accustomed to _____ the water than experiencing it first hand, the _____ at Rishikesh river rafting rapids posed a bit of a challenge.

Solution Video | Have any Doubt ?

A exploring, dive — Your answer is **Wrong**

B researching, fall

C studying, plunge — Correct Option

Solution :
(c)
'Explore' means to examine or evaluate or travel through, this won't fit into sentence 2 as it mentions people who haven't experienced water. 'Shove' is incorrect in sentence 1, it means to push (roughly) which does not fit into the context here, similarly 'fall' means to suddenly go down onto the ground or towards the ground without intending to you just fall. You don't take fall. Considering sentence 1 here, a satellite studying a planet makes more sense than just observing a planet.

D surveying, shove

QUESTION ANALYTICS +

Q. 3

Choose the option which can be used to substitute for 'state in which the few govern the many'.

Solution Video | Have any Doubt ?

A Monarchy — Your answer is **Wrong**

B Plutocracy

C Oligarchy — Correct Option

Solution :
(c)
Oligarchy is a state in which the few govern the many. Monarchy is a form of government with a monarch at the head. Plutocracy is government by the wealthy. Autocracy is a state governed by one person with absolute power.

D Autocracy

QUESTION ANALYTICS +

Q. 4

Four athletes are standing at the vertices of a square park. When a whistle is blown, each of the atheletes starts running along the sides of the park at a speed of 20 km/hr. The probability that they do not collide with each other is

Solution Video | Have any Doubt ?

A 0.125 — Correct Option

Solution :
(a)
We are given 2 specific inputs:
(a) the four atheletes are moving at the same speed and
(b) they are moving along the sides of the park only.
They will NOT collide if the direction of their movement is identical i.e. either all four of them

move in clockwise direction OR all of them move in anticlockwise direction.

$P(\text{all move in clockwise direction}) = \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} = \frac{1}{16}$

$P(\text{all move in anti clockwise direction}) = \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} = \frac{1}{16}$

$\text{Required probability} = P(\text{clockwise}) + P(\text{anticlockwise}) = \frac{1}{16}+\frac{1}{16} = \frac{1}{8} = 0.125$

B 0.16

C 0.25 Your answer is **Wrong**

D 0.50

QUESTION ANALYTICS +

Q. 5

Three taps A, B and C can fill a cistern in 20, 24 and 30 hours respectively. On a given day, tap A is opened at 6:00 AM to fill the empty cistern. Tap B is also opened after two hours and tap C is opened another two hours later. When all three taps have been opened for two hours simultaneously, tap B is required to be closed. The minutes from start, after which tap A should be closed so that the cistern is full at 8:00 PM is _____.

Solution Video | Have any Doubt ?

600 Correct Option

Solution :
600

Since the total time to fill the empty cistern individually by each tap is given as 20, 24 and 30 hours respectively, we can say that in one hour the three taps fill $\frac{1}{20}, \frac{1}{24}$ and $\frac{1}{30}^{th}$ part of the cistern.

Tap *B* remains open for 2 hours and tap *C* is open from 10:00 AM till 8:00 PM i.e. 10 hours. We can write

$\frac{x}{20}+\frac{4}{24}+\frac{10}{30} = 1$ or x = 10 hours i.e. 600 minutes which is the required answer.

QUESTION ANALYTICS +

Q. 6

The ratio of the ages between Sachin and Shikhar is 6 : 5. The difference between the ages of Ajinkya and Sachin is more than 5 years. The ages of Mahendra is a prime number between the ages of Sachin and Ajinkya. The ratio of the ages of Shikhar and Ajinkya is 2 : 3. If the ages of all four are integers, the minimum possible difference between the ages of Ajinkya and Mahendra is

Solution Video | Have any Doubt ?

A 3

B 2

C 1 Correct Option

Solution :
(c)

Suppose the ages of Sachin, Shikhar, Ajinkya and Mahendra be a, b, c and d respectively.

$a : b = 6 : 5$

$c - a > 5$;

d = prime number between the ages of Sachin and Ajinkya

Also, $b : c = 2 : 3$

So, $a : b : c = 12 : 10 : 15$

To satisfy the condition required, multiply the ratio by 2.

Thus, $a : b : c = 24 : 20 : 30$

Let Sachin's age be 24 years, Shikhar's age be 20 years and Ajinkya's age be 30 years.
Now, the difference in the ages of Sachin and Ajinkya is greater than 5.
Now, the age of Mahendra is a prime number between the ages of Sachin (a = 24) and Ajinkya (c = 30)
It means, $d = 29$
Hence, required difference between c and d = 30 – 29 = 1 year

D 0

QUESTION ANALYTICS +

Q. 7

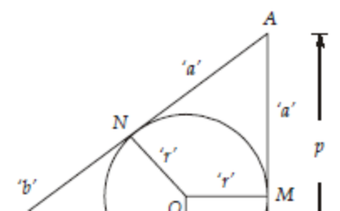
In a right angle triangle *ABC* with vertex B being the right angle, the mutually perpendicular sides *AB* and *BC* are *p* cm and *q* cm long respectively. If the length of the hypotenuse is $(p + q - 6)$ cm, the radius of the largest possible circle that can be inscribed in the triangle is

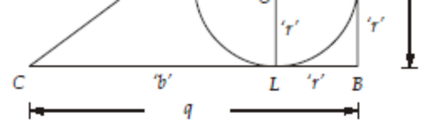
Solution Video | Have any Doubt ?

A 1.5 cm

B 3 cm Correct Option

Solution :
(b)





The largest possible circle that can be inscribed in the triangle is the one which touches the 3 sides.
Since A is an external point from where AN and AM are tangents to this circle, we have $AM = AN = a$ (say)

Similarly, $CN = CL = b$ (say)

If O is the centre of the circle, then $OM = OL = r$ (radius of this circle)

$BC = q = b + r$ and $AB = p = a + r$

We are given the hypotenuse $CA = AN + NC$

$= p + q - 6 = a + b$

Or using the values of p and q,

$b + r + a + r - 6 = a + b$

We get $r = 3$ cm

C 6 cm

D 3.3 cm

QUESTION ANALYTICS +

Q. 8

Nine persons are standing in a 3 × 3 matrix arrangement. Reena is the tallest amongst the shortest persons of each row whereas Seema is the shortest amongst the tallest person in each column. Which of the following cannot be concluded based on these two statements?

Solution Video | Have any Doubt ?

A Reena is the 3rd shortest person.

B Seema is shorter than Reena. Your answer is **Correct**

Solution :
(b)
We can have three possible scenarios:
(I) : Reena and Seema are in the same row. Since Reena is the shortest person in the row, Seema is taller than Reena.
(II) : Reena and Seema are in the same column; once again Seema is taller than Reena since Seema is tallest in the column.
(III) : Reena and Seema are neither in the same row nor in the same column. In this case, there has to a person 'X' who is in the same row as Reena and in the same column as Seema. Now, Reena is shorter than 'X' who is shorter than Seema; which again leads us to conclude that Seema is taller than Reena.

C Seema is the third tallest person.

D Seema is taller than Reena.

QUESTION ANALYTICS +

Q. 9

A sum of ₹ 45,000 is to be distributed amongst NOT more than 18 students as prize amount in denomination of ₹ 250, ₹ 1250, ₹ 6250 and ₹ 31250 such that there is at least one student getting a prize of each denomination and each student gets exactly one prize. The entire amount has to be distributed. The number of ways this amount can be distributed is

Solution Video | Have any Doubt ?

A 1

B 2 Correct Option

Solution :
(b)
We will start with one student each being recipient of one prize value. This implies that 31250 + 6250 + 1250 + 250 = ₹ 39000 has been used up leaving a sum of ₹ 6,000 to be distributed among NOT more than 18 – 4 = 14 students. Since the amount remaining is less than ₹ 6250, this amount has to be distributed as prizes of denomination ₹ 1250 and/or ₹ 250 only.
We can start with four students receiving ₹ 250 each and the remaining ₹ 5,000 can be given to four more students @ ₹ 1250 leading to total number of 12 students receiving the prizes.
Alternately, we can have 4 + 5 = 9 students receiving ₹ 250 each and the remaining ₹ 3750 can be given to three more students @ ₹ 1250 leading to total number of 16 students receiving the prizes.
Any more options are ruled out since we have to increase in steps of 5 – 1 = 4 students only which means that the next option will lead to 20 students getting the prize money which is not possible since there are only 18 students in all.

C 3

D more than 3

QUESTION ANALYTICS +

Q. 10

600 men and 250 women can build a skyscraper in 4 weeks. 450 men and 125 women will take 6 weeks to build the same skyscraper. How many women will be needed to build the skyscraper in one week?

Solution Video | Have any Doubt ?

3000 Correct Option

Solution :
3000

Let the work done by each man in one week = m and by each woman in one week = w.

The total work is say X

$$X = (600\,m + 250\,w)4 = (450\,m + 125\,w)\,6$$

$$\Rightarrow \quad 1200\,m + 500\,w = 1350\,m + 375\,w$$

$$\Rightarrow \quad 150\,m = 125\,w$$

$$\Rightarrow \quad m = \frac{5w}{6}$$

We express X in terms of w

$$X = \left(600 \times \frac{5w}{6} + 250w\right) \times 4$$

$$= 750\,w \times 4 = 3000\,w$$

$\therefore$ 3000 women are required to complete X in one week.

QUESTION ANALYTICS

Q. 11

Which of the following represents a valid inorder traversal of a Binary Search Tree?

Have any Doubt ?

A $2^5, 2^4, 2^3, 2^2, 2^1, 2^0$

B $2^3, 2^2, 2^1, 2^0, 2^4, 2^5$

C $6^0, 5^0, 4^0, 3^0, 2^0, 1^0$ Correct Option

Solution :
(c)
Option (c) is the only valid in order traversal of BST. As the inorder traversal of BST must be sorted in ascending order, options (a) and (b) are wrong. Option (c) simplifies to 1, 1, 1, 1, 1, 1 and therefore is a valid in order traversal of BST. Hence (c) is the correct choice.

D None of these Your answer is **Wrong**

QUESTION ANALYTICS

Q. 12

Consider the following C program:

```
bool foo(char *s)
{
    char c[ ] = "correspondence";
    int i = 0, j = 0;
    while(s[i] && c[j])
    {
        if(s[i] = = c[j]) j++;
        i++;
    }
    if(! c[j]) return true;
    else return false;
}
```

The strings 'responce' and 'credence' are passed to the above function foo one by one and the output is observed in each case. Note that the bool data type returns a value in {true, false}. The outputs obtained will be

Have any Doubt ?

A True, True Correct Option

Solution :
(a)
The above function checks whether the input string s is a subsequence of the string "correspondence". Since both responce and credence are subsequences of correspondence, both will return true and therefore (a) will be the answer.

B True, False

C False, True

D False, False Your answer is **Wrong**

QUESTION ANALYTICS

Q. 13

Consider the following statements given below:
S_1 : User-level threads switching does not require context switching.
S_2 : Virtual memory increases the context switching overhead.
S_3 : Every thread has its own registers and stack but not program counter.
Which of the above statements are correct?

Have any Doubt ?

A S_1 and S_2 only Correct Option

Solution :
(a)
S_1 : User-level threads switching does not require context switching.
S_2 : There is more context switching in virtual memory concept, so it increases the context switching overhead.
S_3 : Every thread has its own registers, stack and program counter. S_3 is incorrect
So option (a) is correct.

B S_2 and S_3 only — Your answer is **Wrong**

C Only S_2

D Only S_1

QUESTION ANALYTICS +

Q. 14

Which of the following is correct about vectored interrupt?

Have any Doubt ?

A Branch address is always assigned to a fixed memory location.

B Interrupt vector gives the branch address of an interrupting device. — Your answer is **Correct**

Solution :
(b)
Interrupt vector gives the branch address of the interrupting device.

C Polling technique is used to transfer the branch information.

D None of the above

QUESTION ANALYTICS +

Q. 15

Let x, y and z be regular expressions. Let α, β, Γ be regular expressions defined as follows.

$\alpha = (x^*y)^*\ x^*y$
$\beta = x^*y\ (x^*y)^*$
$\Gamma = x^*\ (yx^*)^*y$

Let L(α), L(β), L(Γ) be language generated by regular expressions α, β, Γ respectively. Which of the following is true?

Have any Doubt ?

A $L(\alpha) \subset L(\beta),\ L(\beta) \subset L(\Gamma)$

B $L(\beta) \subset L(\alpha),\ L(\beta) \supset L(\Gamma)$

C $L(\alpha) \neq L(\Gamma),\ L(\beta) \neq L(\Gamma)$

D $L(\alpha) = L(\beta),\ L(\beta) = L(\Gamma)$ — Your answer is **Correct**

Solution :
(d)

$$\Gamma = x^*\ (yx^*)^*y$$

Take $P = x^*, Q = y$

Now use $P(QP)^* = (PQ)^*\ P$ to get $\alpha = (x^*y)^*\ x^*y$

Now take $P = y, Q = x^*$

And use $(PQ)^*\ P = P(QP)^*$ to get $\beta = x^*y\ (x^*y)^*$

Since we are able to derive α and β from Γ, option (d) is correct. (All are equal)

QUESTION ANALYTICS +

Q. 16

Consider the following grammar:

$S \rightarrow (A) \mid bB$
$A \rightarrow SA'$
$A' \rightarrow +SA' \mid \in$

What is the FIRST and FOLLOW of non-terminal symbol S?

Have any Doubt ?

A FIRST (S) = {(, b}
FOLLOW (S) = {+, $}

B FIRST (S) = {(, b, ∈}
FOLLOW (S) = {+, $, ∈}

C FIRST (S) = {(, b}
FOLLOW (S) = {+,), $} — Your answer is **Correct**

Solution :
(c)

FIRST (S) = {(, b}
FOLLOW (S) = FIRST (A')
FIRST (A') = {+, ∈}
FIRST (A') contain ∈, so FOLLOW (S) = FIRST (A') ∪ FOLLOW (A)
= {+} ∪ {)}
FOLLOW (S) = {), +, $} ($ because S is a start symbol)

D FIRST (S) = {(, b}
FOLLOW (S) = {+,), (, $}

QUESTION ANALYTICS +

Q. 17

The value of the expression ${}^nC_r + 2{}^nC_{r-1} + {}^nC_{r-2}$, where $2 \le r \le n$ will be equal to

Have any Doubt ?

A ${}^{n+1}C_{r-1}$

B $2({}^{n+1}C_{r+1})$

C ${}^{n+2}C_r$

D ${}^{n+2}C_{n-r+2}$ Your answer is **Correct**

Solution :
(d)

$$= {}^nC_r + 2({}^nC_{r-1}) + {}^nC_{r-2}$$

$$= \underbrace{{}^nC_r + {}^nC_{r-1}} + {}^nC_{r-1} + {}^nC_{r-2}$$

$$\Downarrow$$

$$= {}^{n+1}C_r + {}^nC_{r-1} + {}^nC_{(r-1)-1} \left[{}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r \text{ and } {}^nC_{r-2} = {}^nC_{(r-1)-1}\right]$$

$$\Downarrow$$

$$= \underbrace{{}^{n+1}C_r + {}^{n+1}C_{r-1}}$$

$$\Downarrow$$

$$= {}^{n+2}C_r$$

Now using ${}^nC_r = {}^nC_{n-r+1}$ we get

$= {}^{n+2}C_{n+2-r} = ({}^{n+2}C_{n-r+2})$

Hence option (d) is the answer.

QUESTION ANALYTICS +

Q. 18

A bulb in a stair case has two switches, one switch being at the ground floor and other at the first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. What is the minimum number of NAND gates required to implement such system?

Have any Doubt ?

A 3

B 2

C 4 Correct Option

Solution :
(c)

Functionality of the system can be represented by the below table.

Switch 1(A)	Switch 2(B)	Y (Output)
0	0	0
0	1	1
1	0	1
1	1	0

$$Y = A \oplus B$$

Now, to implement Ex-OR gate.

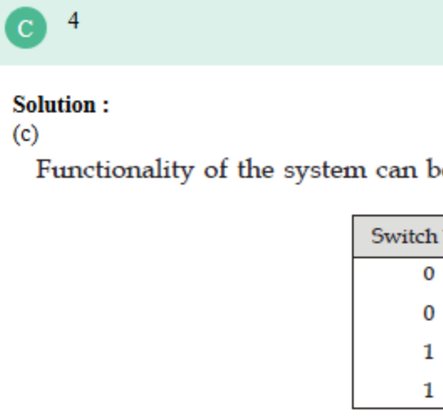
4 NAND gate is required.

D 5

QUESTION ANALYTICS +

Q. 19

Consider the below circuit where I is a 4-bit binary number input $(I_3\, I_2\, I_1\, I_0)$.



The circuit works as

Have any Doubt ?

A Sum = $I - 1$ if X = 0, Sum = $I + 1$ if X = 1

B Sum = $I + 1$ if X = 0, Sum = $I - 1$ if X = 1

C Sum = $I - 1$ if X = 0, Sum = I if X = 1

D Sum = I if X = 0, Sum = $I - 1$ if X = 1 Your answer is **Correct**

Solution :

(d)

Let take an example

$$I = I_3 I_2 I_1 I_0$$

When X = 0

$$\begin{array}{r} I = 0101 \\ +0000 \\ \hline 0101 \end{array} = I$$

When X = 1

$$\begin{array}{r} I = 0101 \\ 1111 \\ \hline \textcircled{1}0100 \end{array} = I - 1$$

Hence Sum = $I - 1$

QUESTION ANALYTICS

Q. 20

Consider a relation R(A, B, C, D, E) with functional dependencies F = {A → B, BC → E, ED → A}
Number of additional relations required to convert it into lossless, dependency preserving 3NF decomposition _____.

Have any Doubt ?

A 1

B 2

C 0 — Correct Option

Solution :
(c)
Relation R(A, B, C, D, E)

$F = \{A \rightarrow B, BC \rightarrow E, ED \rightarrow A\}$

Closure of $(CDE)^+ = \{ABCDE\}$

So CDE is a candidate key of R

Closure of $(ACD)^+ = \{ABCDE\}$

ACD is a candidate key of R

Closure of $(BCD)^+ = \{ABCDE\}$

BCD is a candidate key of R

Total 3 key CDE, ACD, BCD

A, B, C, D, E all are key attribute so relation R is already is 3NF. So, no additional relation required.

D 3

QUESTION ANALYTICS

Q. 21

Given that,
$A(x)$ means "x is an alligator",
$H(x)$ means "x is a human", and
$E(x, y)$ means "x eats y",
Which of the given choices is the best English translation for the following first order logic statement?
$\forall x(H(x) \rightarrow \forall y[E(y,x) \rightarrow A(y)])$?

Have any Doubt ?

A All humans eat alligators

B Alligators eat only humans — Your answer is **Wrong**

C Every Alligators eats humans

D Only alligators eat humans — Correct Option

Solution :
(d)
Option (d) is the most appropriate translation for the above predicate logic statement.

QUESTION ANALYTICS

Q. 22

Consider the following statements.
I. If a finite group G has prime order, then G is guaranteed to be Abelian.
II. A group with infinite order can never be cyclic.
Which of the above statements are correct?

Have any Doubt ?

A Both I and II

B I only — Your answer is **Correct**

Solution :
(b)
Only I is true. II is false, because it uses the phrase 'never' – and we can easily disprove it, as (Z, +) is a well known cyclic group with generators 1 and –1 respectively.
I is true because every prime order group is cyclic and we also know that every cyclic group is Abelian and so the statement I is also correct.

C II only

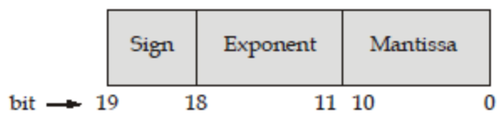
D None of these

D None of these

QUESTION ANALYTICS +

Q. 23

Consider the following floating point format:



What is the representation of 0.875×8^{13} in hexadecimal without normalization?

Have any Doubt ?

A 0xA4580

B 0x38700

C 0xBC300

D 0x53700 — Correct Option

Solution :
(d)

$$\text{Bias} = 2^{8-1} - 1 = +127$$

$$\text{Biased Exponent (B.E.)} = \text{Actual exponent} + \text{Bias}$$

We can write, $8^{13} = (2^3)^{13} = 2^{39}$

Now, $\text{B.E.} = 39 + 127 = 166$

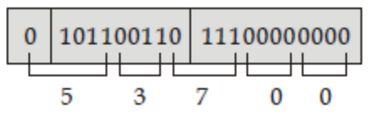
Representing Exponent in binary

$$(166)_2 = (10100110)_2$$

Representing mantissa in binary

$$(0.875)_2 = (0.11100000000)_2$$

Floating point representation will be as follows:



$= 0x53700$

QUESTION ANALYTICS +

Q. 24

Which of the following procedure results same output as Dijkstra's algorithm on unweighted graph with 'n' vertices?

Have any Doubt ?

A Breadth first search — Correct Option

Solution :
(a)
Dijkstra's algorithm will output same as breadth first search on graph and will take $O(m + n)$ time.

B Depth first search

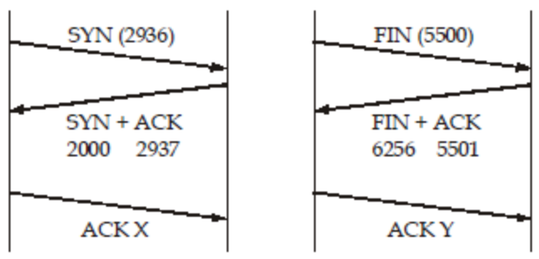
C Kruskal algorithm

D Prim's algorithm — Your answer is **Wrong**

QUESTION ANALYTICS +

Q. 25

Consider the TCP connection where only control segments are exchanged between client and server as shown below.
The TCP follows the same 3-way handshaking procedure.



Which of the following is correct value for X and Y?

Have any Doubt ?

A 2001, 5502

B 2938, 5502

C 2001, 6257 — Your answer is **Correct**

Solution :
(c)
• ACK X value will be 2001.
• ACK Y value will be 6257.
Hence option (c) is correct answer.

D 2938, 6257

QUESTION ANALYTICS +

Q. 26

Consider the following Booths multiplication
Multiplicand: 10010011011
Multiplier: 10100101
The number of substraction operations required in the multiplication will be _____.

Have any Doubt ?

4

Your answer is **Correct**4

Solution :
4

Multiplier	Pair with $(q-1)$	0 operation
1	0	(SUB)
0	1	ADD
1	0	(SUB)
0	1	ADD
0	0	Shift only
1	0	(SUB)
0	1	ADD
1	0	(SUB)

Total 4 SUB required.

QUESTION ANALYTICS

Q. 27

Consider the following code given below:

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

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

Have any Doubt ?

8

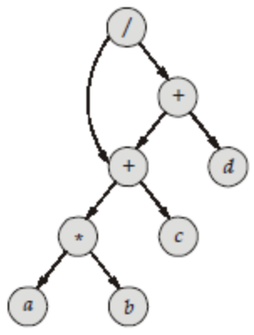
Your answer is **Correct**8

Solution :
8

$$\left.\begin{matrix} a = a * b \\ c = a + c \end{matrix}\right\} c = a * b + c$$

$$e = c + d \} \; e = a * b + c + d$$

$$a = c / e \} \; a = a + c / a * b + c + d$$



Total 8 nodes presented in the DAG representation.

QUESTION ANALYTICS

Q. 28

Consider the following C code:

```
#include <stdio.h>
#include <iostream>
int bar(int m, int n)
{
        if(m == 0) return n;
        if(n == 0) return m;
        return bar(n%m, m);
}
int foo(int m, int n)
{
        return (m*n/bar(m, n));
}
int main( )
{
        int x = foo(1000, 1500);
        printf("%d", x);
        return 0;
}
```

The output of the program will be _____.

Have any Doubt ?

3000

Correct Option

Solution :
3000

The function foo( ) computes the LCM of the integers m and n, given as input. Let's see why.
We know the relation, LCM(m, n) * GCD(m, n) = m * n
So we can write, LCM(m, n) = m * n/GCD(m, n)
So we know that the LCM of 1000 and 1500 will be 3000.
Therefore 3000 will be the answer.

Your Answer is 15000

QUESTION ANALYTICS

Q. 29

Consider the following expression in reverse polish notation.
100 200 + 2 / 5 * 7 + 245 – 256 – 4 *
Let the value obtained by the evaluation of the above expression be X. Then the value of $\sqrt{X}$ will be _____.

Have any Doubt ?

32 — Your answer is **Correct** 32

Solution :
32
Upon evaluating using the postfix evaluation algorithm, we see that X = 1024.
Therefore $\sqrt{X} = 32$
Hence 32 will be the answer.

QUESTION ANALYTICS

Q. 30

Consider the following processes, their arrival time and burst time given below:

Process	Arrival Time	Burst Time
P_0	1	2
P_1	6	4
P_2	4	7
P_3	5	4

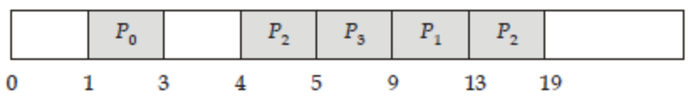
(All time in milliseconds)

Operating system uses Shortest Remaining Time First (SRTF) algorithm to schedule the processes.
What is the average waiting time _____ ms. (Upto 2 decimal places)

Have any Doubt ?

2.75 (2.75 - 2.75) — 2.75
Your answer is **Correct**

Solution :
2.75 (2.75 - 2.75)



Gantt chart

Waiting Time = Turn Around Time – Burst Time

Process	Waiting Time
P_0	0
P_1	3
P_2	8
P_3	0

$$\text{Average Waiting Time} = \frac{\sum_{i=0}^{n} \text{Waiting Time of } P_i}{\text{Total number of process}}$$

$$= \frac{0+3+8+0}{4} = \frac{11}{4} = 2.75 \text{ ms}$$

QUESTION ANALYTICS

Q. 31

Let $|L|$ denote the number of strings present in L. Let R and S be two languages, such that $|R \cup S| = 96$ and $|R \cap S| = 32$. Then the value of $|(R - S) \cup (S - R)|$ is equal to _____.

Have any Doubt ?

64 — Correct Option

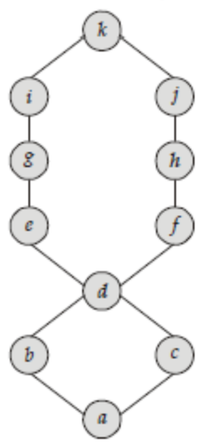
Solution :
64

$$|(R - S) \cup (S - R)| = |R \oplus S| = |R \cup S| - |R \cap S|$$
$$= 96 - 32 = 64$$

QUESTION ANALYTICS

Q. 32

The number of totally ordered sets compatible to the given POSET are _____.



Have any Doubt ?

40 — Correct Option

Solution :

40

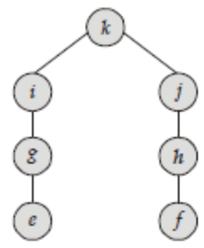
We have to fill in the following blanks in order to find the number of total order sets of the above POSET.

$\boxed{a}$ _____ $\boxed{k}$

Now 2nd and 3rd positions can be filled in 2! ways (b, c or c, b) and then at 4th place 'd' has to be there.

$\boxed{a}\left(\begin{matrix} b & c \\ c & b \end{matrix}\right)\boxed{d}$ _____ $\boxed{k}$

Now after deleting 'd' we have the following picture.



Now we have to fill in the remaining blanks and make sure the following dependency is preserved. ($a \to b$ indicates a must come before b)

$$\begin{pmatrix} e \to g \\ g \to i \end{pmatrix} \text{ and } \begin{pmatrix} f \to h \\ h \to j \end{pmatrix}$$

Now out of the 6 blanks we will choose 3 blanks and fill (e, g, i) in those 3 blanks $\Rightarrow {}^6C_3$ ways.
Now we're only left with 3 blanks and we can fill f, h, j in only 1 way.
So number of toposorts = $2! \times {}^6C_3 = 2 \times 20 = 40$

Your Answer is 4

QUESTION ANALYTICS

Q. 33

Consider the following relations where keys are underlined:
P(X, Y, Z) and Q(A, X)
P contain 500 records and Q contain 1500 records. X in Q is a NON-NULL attribute and a foreign key referencing to P. If a is the maximum number of records in
P ⋈ Q and b is the minimum number of records in P ⋈ Q. What is the value of $2a - b$ _____. (Where ⋈ is a natural join)

Have any Doubt ?

1500

1500
Your answer is **Correct**

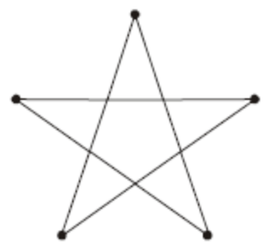
Solution :
1500
'X' in P is a key so it contain all different value and 'X' in Q is not key and referencing to P so all its record will match to 'X' in P.
So there is total 1500 minimum record and also 1500 maximum records.

$$\begin{aligned} a &= 1500, b = 1500 \\ 2a - b &= 2 \times 1500 - 1500 \\ &= 1500 \end{aligned}$$

QUESTION ANALYTICS

Q. 34

Consider the following graph G:



G

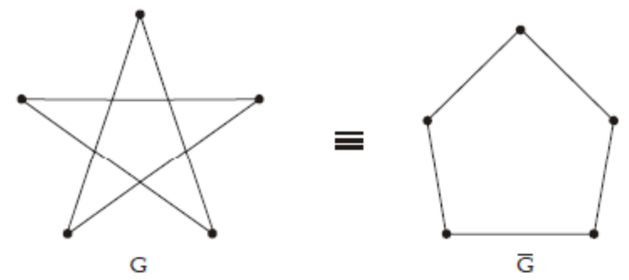
Let X and Y denote the number of spanning trees and chromatic number of G respectively. Then the value of X + Y will be equal to _____.

Have any Doubt ?

8

Correct Option

Solution :
8
G happens to be a self complementary graph (G is isomorphic to $\bar{G}$).



G $\equiv$ $\bar{G}$

So G is isomorphic to C_5 (cycle graph with 5 vertices).
Therefore number of spanning trees $(C_5) = {}^5C_4 = 5$
Hence $X = 5$
Chromatic number $(C_5) = 3$
$\therefore$ $(X + Y) = 5 + 3 = 8$

Your Answer is 5

QUESTION ANALYTICS

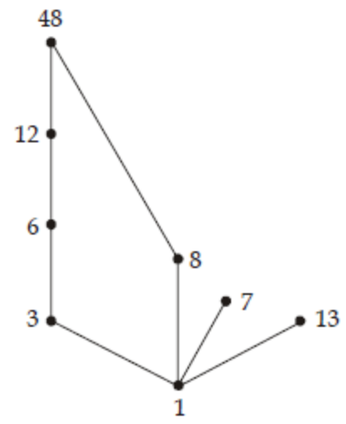
Q. 35

The number of edges in the Hasse diagram of ({1, 3, 6, 7, 8, 12, 13, 48}, /) is equal to _____.

Have any Doubt ?

8 — Correct Option

Solution :
8



So we can count the number of edges and they are equal to '8'.

Your Answer is 9

QUESTION ANALYTICS +

Q. 36

Consider the following C implementation which when given 3 numbers a, b, c as input, finds the maximum of 3 numbers a, b and c.

```
int kickstart(int a, int b, int c)
{
    if(B1) return a;
    if (a >= b) return B2;
    return kickstart(c, a, b);
}
```

A student named Deepak attempts to fill in these boxes B1, B2, and B3 in the following ways:

I. B1: $a >= b \&\& a > c$; B2: kickstart(c, b, a);
II. B1: $a >= b \&\& a >= c$; B2: kickstart(c, b, a);
III. B1: $a >= b \&\& a >= c$; B2: kickstart(c, a, b);
IV. B1: $a >= b \&\& a >= c$; B2: kickstart(b, c, a);

For which of the above approaches, the implementation fails to work correctly?

Have any Doubt ?

A Only I

B I and II only

C II, III and IV only — Your answer is **Wrong**

D I and IV only — Correct Option

Solution :
(d)
I will fail the case when $a = b = c$
For example, take kickstart(1, 1, 1)
kickstart(1, 1, 1) will keep calling itself in case 1, and won't produce any output, thus overflowing the stack.
II and III will work totally fine for all inputs.
However IV will fail in some cases, for example take kickstart(2, 4, 3).
kickstart(2, 4, 3) ⇒ kickstart(3, 2, 4) ⇒ kickstart(2, 4, 3) ⇒ kickstart (3, 2, 4) ⇒ ...
So as it can be seen the recursion looks like a cycle of length 2 (just for the sake of clarity) and the program will go into a hang.
So (d) is also an incorrect implementation.

QUESTION ANALYTICS +

Q. 37

Consider an error-free 64-kbps satellite channel used to send 512-byte data frames in one direction, with very short acknowledgments coming back the other way. Assume the earth-satellite propagation time is 270 msec. what is the minimum window size so that the channel is fully utilized?

Have any Doubt ?

A 1

B 7

C 10 — Your answer is **Correct**

Solution :
(c)
With a window size of 10 frames
Maximum data that can transferred

$$= 10 \times \text{Frame size}$$
$$= 10 \times 512 \times 8 \text{ bit} = 40960 \text{ bit}$$

$$\text{R.T.T.} = 2 \times \text{Propagation Time}$$
$$= 2 \times 270 \text{ msec} = 640 \text{ msec}$$

So, in 1 R.T.T. maximum 40960 bit
Can be transferred
Now, Data rate = 640 msec → 40960 bit
1 sec → ?

$$= \frac{40960}{640 \times 10^{-3}} \text{bit/sec} = 64 \text{ Kbps}$$

For a window size of 10 or greater channel efficiency is fully utilized.
So, minimum window size is 10.

D 15

QUESTION ANALYTICS +

Q. 38

Consider the following grammar:

$S \rightarrow AaBb$

$A \rightarrow ce \mid d$

$B \rightarrow cB \mid d \mid D$

$D \rightarrow e$

Which of the following is true about the above grammar?

Have any Doubt ?

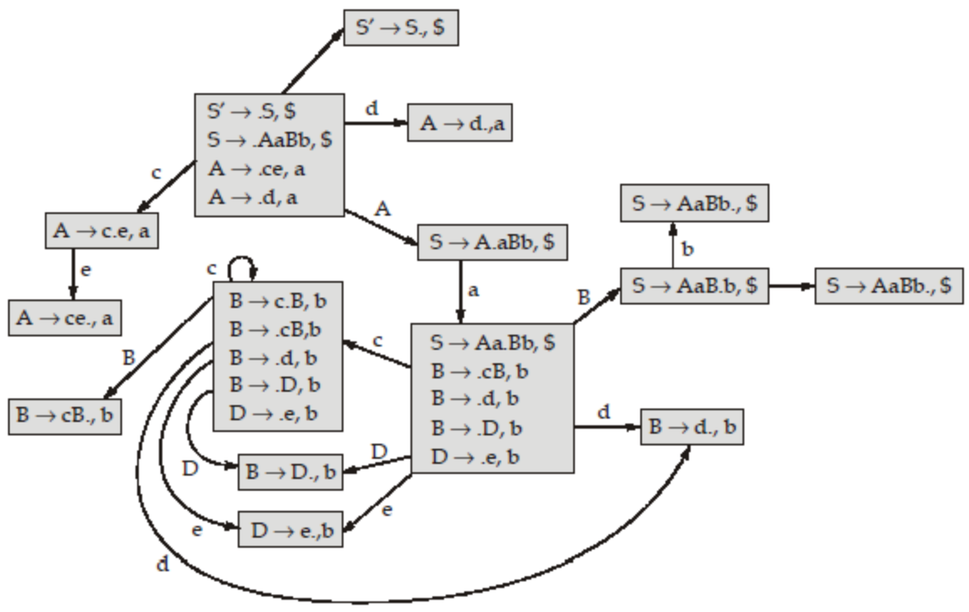
A SLR(1) but not LR(0)

B Only CLR(1)

C CLR(1) but not LALR(1)

D SLR(1) and LR(0) — Correct Option

Solution :
(d)



It contain no conflicting state.
So the grammar is LR(0), SLR(1), LALR(1) and CLR(1).

QUESTION ANALYTICS +

Q. 39

Consider a unix inode, which maintain 20 direct pointers, 3 single indirect, 2 double indirect and 4 triple indirect pointers. Disk block size is 4 KB and disk block address is 32 bits. What is the maximum possible file size? (File is stored in last 4 triple indirect DBA's)

Have any Doubt ?

A 512 GB

B 1024 GB

C 16384 GB — Your answer is **Correct**

Solution :
(c)

$$\text{Block size} = 4\ \text{KB}$$

$$\text{Block address} = 32\ \text{bits} = 4\text{B}$$

The number of disk block pointers that will fit in one block

$$= \frac{2^{12}\text{B}}{4\text{B}} = 2^{10}$$

Maximum file size can be possible with triple indirect pointers.

$$\text{File size due to all pointers} = (20 + 3 \times 2^{10} + 2 \times 2^{10} \times 2^{10} + 4 \times 2^{10} \times 2^{10} \times 2^{10})\ 4\text{KB}$$

Direct pointer; Single indirect pointer; Double indirect pointer; Triple indirect pointer; Block size

$$\text{Maximum file size} = 4 \times 2^{10} \times 2^{10} \times 2^{10} \times 2^{12}\text{B}$$

$$= 2^{14}\ \text{GB}$$

$$= 16384\ \text{GB}$$

So option (c) is correct.

D 4096 GB

QUESTION ANALYTICS +

Q. 40

Consider the following schedules involving three transaction:

S : $r_1(x), r_2(z), r_1(z), r_3(z), r_3(y), w_1(x), r_2(x), c_1, w_3(y), c_3, r_2(y), w_2(y), c_2$

(Where X, Y, Z are data items and items and R(x) and W(x) denote the read and write operation on that data item and C_i is the commit operation of

transaction T_i).

Which of the following is correct about the above schedule?

Have any Doubt ?

A Schedule is conflict serializable and contain blind write.

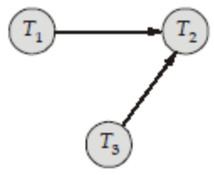
B Schedule contain dirty read and it is not recoverable.

C Schedule is conflict serializable and does not contain dirty read.

D Schedule contain dirty read and not contain blind write. Your answer is **Correct**

Solution :
(d)

Precedence graph of S

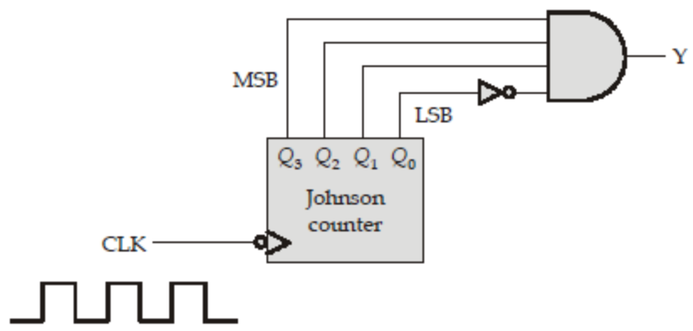


It does note contain any cycle so conflict serializable.
All transaction are first reading the value before writing it so it does not contain any blind write.
Transaction T_2 is reading the value of x that is written by an uncommitted T_1 so it has dirty read operation. The schedule is recoverable.
So option (d) is correct.

QUESTION ANALYTICS +

Q. 41

Consider the digital circuit given below:



Assume initially Johnson counter is in reset state. The number of clock cycles required to make the output at Y = 1 is (Assume delay in circuit and gate is zero).

Have any Doubt ?

A 3 Correct Option

Solution :
(a)

Output Y = 1 only when $Q_3 = 1$, $Q_2 = 1$, $Q_1 = 1$ and $Q_0 = 0$.
The truth table of Johnson counter is as follows:

CLK	Q_3	Q_2	Q_1	Q_0	Y
0	0	0	0	0	0
↓ 1	1	0	0	0	0
↓ 2	1	1	0	0	0
↓ 3	1	1	1	0	(1) ←

Output Y = 1 when 3 clock cycles is applied.

B 4

C 5

D 6

QUESTION ANALYTICS +

Q. 42

Consider the boolean expression F(A, B, C, D) = Σm = (0, 1, 2, 5, 6, 7, 8, 10, 14, 15). Find the number of essential prime implicants

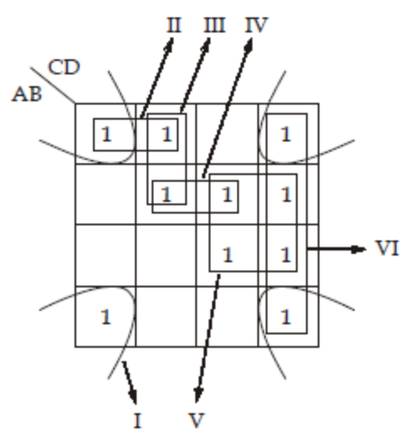
Have any Doubt ?

A 0 Your answer is **Wrong**

B 1

C 2 Correct Option

Solution :
(c)



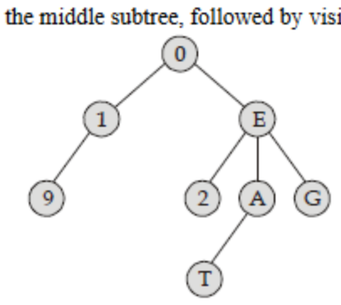
Only (I) and (V) are essential prime implicants all others are non-essential prime implicants. Hence number of essential prime implicants is 2.

D 3

QUESTION ANALYTICS +

Q. 43

Consider the following ternary tree. We define the out-order traversal of a ternary tree as rightmiddle- root-left i.e. first visit the right subtree, then visit the middle subtree, followed by visiting the root and lastly the left subtree of the root respectively.



The out order traversal of T will be

Have any Doubt ?

A EGAT2019

B GATE2019 Your answer is **Correct**

Solution :
(b)
The out order traversal will be GATE2019.
Hence (b) will be the answer.

C GTAE2019

D TGAE2019

QUESTION ANALYTICS +

Q. 44

Consider the two process P_i and P_j need to access a critical section. The following synchronization construct used by both the processes.

```
Process Pi                      Process Pj
While (True)                    While (True)
{                               {
    j = False;                      i = False;
    i = True;                       j = True:
While (j = = True);             While (i = = True);
CRITICAL SECTION                    CRITICAL SECTION
    i = False;                      j = False;
}                               }
```

(Here i and j are two boolean shared variable between process P_i and P_j). Which of the following is true about the above construct?

Have any Doubt ?

A Satisfy mutual exclusion but does not prevent deadlock.

B Prevent deadlock but does not satisfy mutual exclusion.

C Mutual exclusion and deadlock prevention both are satisfied.

D Neither mutual exclusion nor deadlock prevention is satisfied. Correct Option

Solution :
(d)
When both process P_i and P_j execute simultaneously then P_i execute i = true and P_j execute j = true and while executing While loop no process will enter into CRITICAL SECTION. This is a deadlock condition.
When P_i first executed then P_i enter into CRITICAL SECTION and when P_j execute then it also enter into CRITICAL SECTION.
So it does not satisfy mutual exclusion.

QUESTION ANALYTICS +

Q. 45

Consider the following grammar and their Syntax Directed Translation (SDT) rules.

$S \rightarrow S * A$ {S.val = S.val × A.val}
$S \rightarrow A$ {S.val = A.val}
$A \rightarrow A + B$ {A.val = A.val – B.val}
$B \rightarrow (S)$ {B.val = 2}
$A \rightarrow B$ {A.val = B.val}
$B \rightarrow id$ {B.val = id.val}

(Here id represent a integer and id.val is value of that integer)

S_1 : Given SDT is L-attributed and using L-attributed evaluation the value of the expression 4 * 6 + 3 * 7 is 84.

S_2 : Given SDT is S-attributed and using S-attributed evaluation value of the expression 4 * 6 + 3 * 7 is 84.

Which of the above statements are true with respect to the above SDT.

Have any Doubt ?

A Only S_1

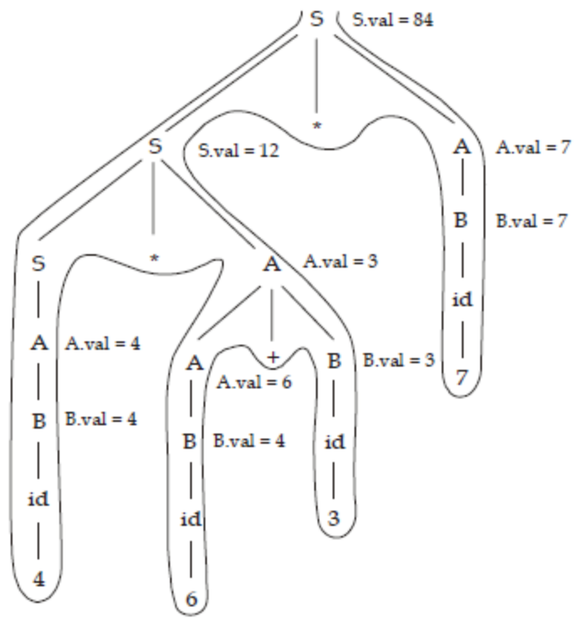
B Only S_2

C Both S_1 and S_2 Correct Option

Solution :
(c)

Given SDT is L-attributed and S-attributed both, all the translation rules are written at the right end and there is no inherited attribute.

Expression 4 * 6 + 3 * 7



Value of the expression is 84.

So both S_1 and S_2 is correct.

D None of the above

QUESTION ANALYTICS +

Q. 46

Consider a procedure find ( ) which take array of n integers as input and produce pair of elements of array whose difference is not greater than the difference of any other pair of element of that array. Which of the following represent worst case time complexity of find ( ) procedure?

Have any Doubt ?

A O(n)

B O(n log n) Your answer is **Correct**

Solution :
(b)

Using divide and conquer approach, closest pair can be found in O(n log n) time.

Algorithm :

Step 1 : Divide the set into two equal sized parts by the line l, and recursively compute the distance in each part. [d_1 = closest pair (left half); d_2 = closest pair (right half)] and returning the points in each set in order that is sorted by y-coordinate].

Step 2 : Let 'd' be the minimal of two minimal distances

$$d = \min(d_1, d_2) \text{ ....O(1)}$$

Step 3 : Eliminate points that lie farther than 'd' apart from l, ...O(n).

Step 4 : Merge the two sorted lists into one sorted list ...O(n).

Step 5 : Scan the remaining points in the y-order and compute the distances of each point to its 5 neighbour ...O(n).

Step 6 : If any of these distances is less than 'd' the update 'd' ...O(1).

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

$$T(n) = O(n \log n)$$

C O(n^2)

D O(n^2 log n)

QUESTION ANALYTICS +

Q. 47

A CPU has recorded 450 memory references. The CPU has been organized into 2-level of cache memory L_1 and L_2. There are 50 misses and 25 misses in L_1 and L_2 respectively. The miss penalty from L_2 cache to memory is 60 cycles and hit time of L_2 cache is 30 cycles. What is the average stall (in cycles) per instruction.

If there are 3 memory reference per instruction?

Have any Doubt ?

A 20 Correct Option

Solution :
(a)

3 memory reference → 1 instructions

450 memory reference → ?

$$\text{Number of instruction} = \frac{450}{3} = 150$$

$$\left[\frac{\text{Number of memory stalls}}{\text{Number of instructions}}\right] = \left[\frac{\text{Number of misses } L_1}{\text{Number of instructions}} \times \text{hit } L_2\right] + \left[\frac{\text{Number of misses } L_2}{\text{Number of instructions}} \times \text{miss penality } L_2\right]$$

$$= \left[\frac{50}{150} \times 30\right] + \left[\frac{25}{150} \times 60\right]$$

$$= [10 + 10] = 20 \text{ cycles}$$

B 40

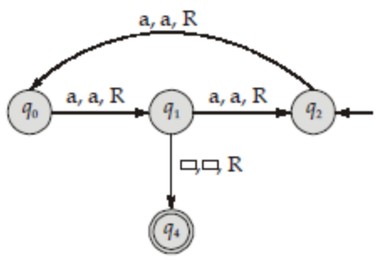
C 18

D 32

QUESTION ANALYTICS +

Q. 48

Consider the state diagram of Turing Machine T, over $\Sigma = \{a\}$ and $\Gamma = \{a, \sqcup\}$.



The language accepted by T will be

Have any Doubt ?

A $L(T) = \{w \mid w \in \Sigma^*, |w| = 3x, x \text{ is integer}\}$

B $L(T) = \{w \mid w \in \Sigma^*, |w| = 3x + 1, x \text{ is integer}\}$ Your answer is **Wrong**

C $L(T) = \{w \mid w \in \Sigma^*, |w| = 3x + 2, x \text{ is integer}\}$ Correct Option

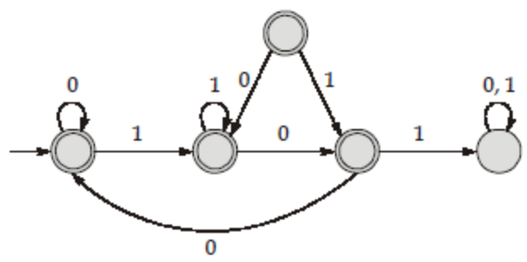
Solution :
(c)
The Turing Machine T is accepting regular language (aaa)* aa [number of a's = $3x + 2$]. This is because the start state is q_2 instead of q_0. Had initial state been q_0, language would have been a(aaa)*.
So correct choice is option (c).

D $L(T) = \{w \mid w \in \Sigma^*, n_a w = 3x, x \text{ is integer}\}$

QUESTION ANALYTICS +

Q. 49

Let M be a deterministic finite automata as shown below:



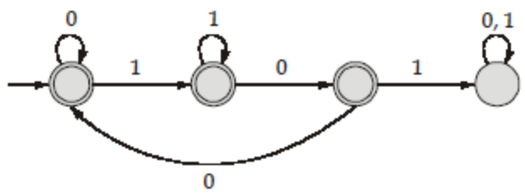
Let S denote the set of 7 bit binary strings in which the first, the fourth and the last bits are 1. The number of strings in S that are accepted by M is equal to

Have any Doubt ?

A 3

B 4 Your answer is **Correct**

Solution :
(b)
The DFA has an unreachable state, so lets first simplify the DFA.



Now we can see that the DFA represents set of strings not containing '101' as a substring. We have count number of 7 bit binary strings in which the first, 4th and 7th bits is '1', which go to the accepting state of DFA.
1 _ _ 1 _ _ 1
$b_1\, b_2\, b_3\, b_4\, b_5\, b_6\, b_7$
(b_2, b_3) can be either (0, 0) or (1, 1) $\Rightarrow$ 2 ways
(b_5, b_6) can be either (0, 0) or (1, 1) $\Rightarrow$ 2 ways
Total number of ways = $2 \times 2 = 4$
So there are 4 strings which will be accepted by M.

C 7

D 11

QUESTION ANALYTICS +

Q. 50

Consider the following POSETs:

I. $(\{1, 2, 5, 7, 10, 14, 35, 70\}, \leq)$
II. $(\{1, 2, 3, 6, 14, 21, 42\}, /)$
III. $(\{1, 2, 3, 6, 11, 22, 33, 66\}, /)$

Which of the above POSETs are isomorphic to (P (S), $\subseteq$), where S = {a, b, c}?

Have any Doubt ?

A I and II

B II and III

C I, II and III

D III only — Your answer is **Correct**

Solution :
(d)
Although I and II represent D_{60} and D_{66}, II is not D_{42}, because the divisor 7 is missing. So there's no way for II to be isomorphic to [P({a, b, c}), ⊆], as it needs to have 8 divisors but right now it has only 7.
Now I won't be isomorphic, as even though I looks like D_{70}, it is actually on the ≤ relation, resulting in a chain, which won't be a Boolean algebra.
III is D_{66}, a well known Boolean algebra and has 8 vertices is its Hasse diagram and will be isomorphic to [P({a, b, c}), ⊆].

QUESTION ANALYTICS +

Q. 51

Let A(n) denotes the number of n bit binary strings which have no pair of consecutive 1's. Then the time complexity of the efficient algorithm which uses dynamic programming to compute A(n) will be

Have any Doubt ?

A O(n) — Correct Option

Solution :
(a)
If we see the pattern carefully by taking small values, it always follows that A(n) is always the sum of A(n – 1) and A(n – 2).
Hence A(n) is equivalent to the n^{th} Fibonacci number.
Thus, using dynamic programming, the time complexity will be O(n).

B $O(2^n)$ — Your answer is **Wrong**

C $O(n^3)$

D O(nlog n)

QUESTION ANALYTICS +

Q. 52

Let T_1 and T_2 denote the worst case time complexities of sorting an array A of size N using merge sort and quick sort respectively. Suppose the size of array is changed from N to 2^N. Let the corresponding times be T_1' and T_2'. Then $(T_1' + T_2')$ will be asymptotically equal to

FAQ | Have any Doubt ?

A $O(N \cdot 2^N)$

B $O(N^{2N})$

C $O(2^{2N})$ — Your answer is **Correct**

Solution :
(c)

$$\text{Merge sort on N elements} \Rightarrow O(N \log N)$$
$$\text{Quick sort on N elements} \Rightarrow O(N^2)$$
$$\therefore \quad \text{Merge sort on } 2^N \text{ elements} \Rightarrow 2^N \log(2^N) = N \cdot 2^N$$
$$T_1' = O(N \cdot 2^N)$$
$$\text{Similarly quick sort on } 2^N \text{ elements} = O((2^N)^2)$$
$$T_2' = O(2^{2N})$$
$$\text{Now} \quad T_1' + T_2' = O(N \cdot 2^N + 2^{2N})$$

Now which is bigger? 2^{2N} or $N \cdot 2^N$? Let's check.
$(N \cdot 2^N, 2^{2N})$
Cancel common terms by dividing by 2^N.

$$\left(N, \frac{2^{2N}}{2^N}\right) \Rightarrow (N, 2^N)$$

Clearly 2^N is bigger than $N \Rightarrow 2^{2N}$ is asymptotically larger than $N \cdot 2^N$.
Therefore $2^{2N} + N \cdot 2^N = O(2^{2N})$
Thus, (c) is correct option.

D None of these

QUESTION ANALYTICS +

Q. 53

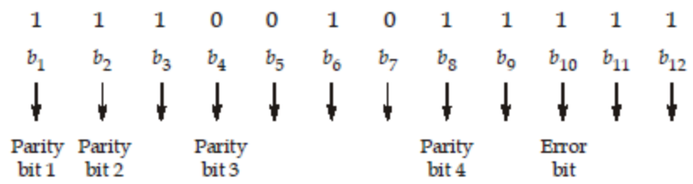
Host A transmits 12-bit Hamming code whose hexadecimal value is 0xE5F arrives to Host B who is at the receiver end. The medium through the code has been transmitted is not error free but cannot damage parity bit and parity bits has been inserted from left to right at their respective positions. What was the original value Host A transmitted in hexadecimal? (Assume that not more than 1 bit is in error.)

Have any Doubt ?

A 0xAB — Correct Option

Solution :
(a)

If we number the bits from right to left ($b_1\ b_2$ ..... b_{12}) where bit 1, bit 2, bit 4 and bit 8 are parity bits. Bit 2 and bit 8 (a parity bit) is incorrect. Hence message at bit 10 has been modified. The 12-bit value transmitted (after Hamming encoding) was 0xA4F.
The original 8-bit data value was 0xAB.
0xE5F - 1110 0100 1111



Original data was 0xAB - 1010 1011

B 0xAF

C x2A

D 0x2F

QUESTION ANALYTICS +

Q. 54

Consider the following C code:

```
int R(int m, int n)
{
    if(m == 0) return n + 2;
    if(n == 0) return R(m - 1, 1);
    return R(m - 1, R(m, n - 1));
}
```

The output corresponding to the function call R(1,100) will be _____.

Have any Doubt ?

203 Correct Option

Solution :
203
Let's analyze the output using smaller values.

R(1, 1) = 5
R(1, 2) = 7
R(1, 3) = 9
...

Since there's a definite pattern in the values being returned, therefore we can generalize it as follows.

$R(1, n) = 2n + 3$

Therefore the value returned by R(1,100) will be = 2(100) + 3 = 203.

Your Answer is 201

QUESTION ANALYTICS +

Q. 55

Consider the following relation:

Eid	Ename	Salary
10	A	1000
15	B	2500
28	X	1800
53	A	3500
5	Y	2700
29	Z	2100
32	C	2700
52	X	1800

Employee

Consider the following SQL query:

```
SELECT E.id FROM Employee E WHERE
E.salary = (SELECT MAX (E1.salary) FROM
        Employee E1 WHERE E1.salary ≠
    (SELECT MAX (E2.salary) FROM Employee E2))
```

The number of tuples that will be returned by the SQL query is _____.

Have any Doubt ?

2 Correct Option

Solution :
2
SQL query returned the Eids of employee who make the second highest salary.
Relation returned by the SQL query.

Eid
5
32

Total 2 tuples returned.

QUESTION ANALYTICS +

Q. 56

Consider a 3 km of coaxial cable in which 15 computers are connected. Each node has a capacity to transmit 100 frames/second where the average frame length is 1800 bits. The transmission rate at each node is 65 Mbps. The efficiency of the protocol is _____. (in % upto 2 decimal places)

Have any Doubt ?

4.15 (4.00 - 4.20) — Correct Option

Solution :

4.15 (4.00 - 4.20)

Each computer can transmit = 100 frames/second

$$\text{System thoughput} = 15 \times 100 = 1500 \text{ frames/sec}$$

$$\text{Maximum System Rate} = \frac{\text{Transmission rate}}{\text{Frame length}}$$

$$= \frac{65\times10^6 \text{ bits}}{1800 \text{ bits}} = 36111.11 \text{ frames/sec}$$

$$\text{Now, efficiency} = \frac{\text{System throughput}}{\text{Maximum system rate}}$$

$$= \frac{1500}{36111.11}\times100\% = 4.15\%$$

QUESTION ANALYTICS

Q. 57

A hypothetical CPU supports 300 instructions. Each instructions takes 5 cycles to accomplish the execution. The control unit is designed using vertical programming which has 130 control signals, 64 flags and 12 branch conditions. X and Y represents number of bits required for Control Address Register (CAR) and Control Data Register (CDR) respectively. The value of X + Y is _____.

Have any Doubt ?

40 — Correct Option

Solution :

40

Number of instruction in the CPU = 300

Number cycles/instruction = 3 minimum, 5 maximum

In worst case, number of cycles/instruction = 5

Total number of μ-instruction in the CPU = 300 × 5 = 1500 μ-instruction

$$\text{Number of bits required for CAR} = \lceil \log_2 1500 \rceil$$

$$X = 11 \text{ bit}$$

Now,

Branch conditions	Flag	Control signal	CM address
4 bit	6 bit	8 bit	11 bit

$$\mu\text{-instruction size} = 29 \text{ bits}$$

$$\text{Number of bits required for CDR} = 29 \text{ bits}$$

$$Y = 29 \text{ bit}$$

$$X + Y = 11 + 29 = 40 \text{ bit}$$

Your Answer is 27

QUESTION ANALYTICS

Q. 58

Let l, m, n be 3 regular expressions. Consider the following identities.

I. $(l^* m^* n^*)^* = (lm^* + mn^* + nl^*)^*$

II. $(mn + m)^* m = m(nm + m)^*$

III. $(l^* m^* n^*)^* = (l^* + m^*n + n^*)^*$

IV. $(l^* m)^* = (l + m)^*$

How many of the above identities are incorrect _____.

Have any Doubt ?

2 — Correct Option

Solution :

2

Correct: I, II

Incorrect: III, IV

I is a classical case of bracketed star.

$$\text{LHS} = (l + m + n)^*$$

$$\text{RHS} = (l + m + n + ...)^*$$

Since we can get l, m, n separately, RHS is equal to $(l + m + n)^*$.

Therefore I is true.

II is also true. Let's see why

$$(mn + m)^* m = m(nm + m)^*$$

LHS:

$$= (mn + m)^* m$$

$$= (m + mn)^* m \quad \text{(Commutative property of regular expressions)}$$

$$= \left(\frac{m}{p}\frac{(\in + n)}{q}\right)^* \frac{m}{p}$$

Now using, $(pq)^*p = p(qp)^*$, we get

$$= m[(\in + n)\, m]^*$$

$$= m[m + nm]^* = \text{RHS} \Rightarrow \text{II is true}$$

III is false as we can't get "m" separately from RHS.

Similarly, IV is also false as we can't generate "l" separately from LHS.

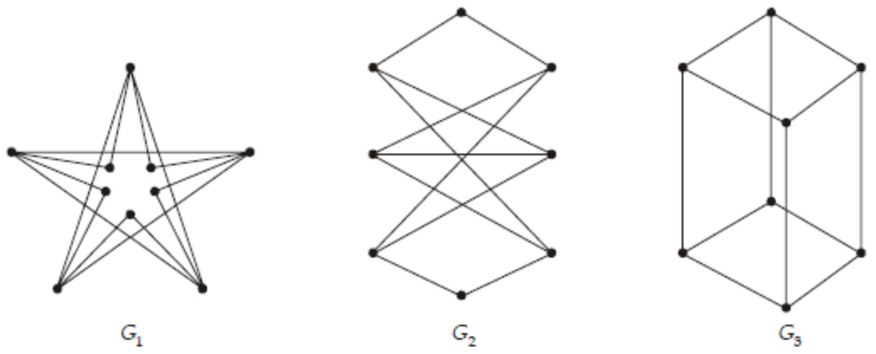
Therefore (2) is the answer.

Your Answer is 1

QUESTION ANALYTICS

Q. 59

Consider the following graphs G_1, G_2 and G_3.



G_1 G_2 G_3

The number of graphs which are planar _____.

Have any Doubt ?

1 Correct Option

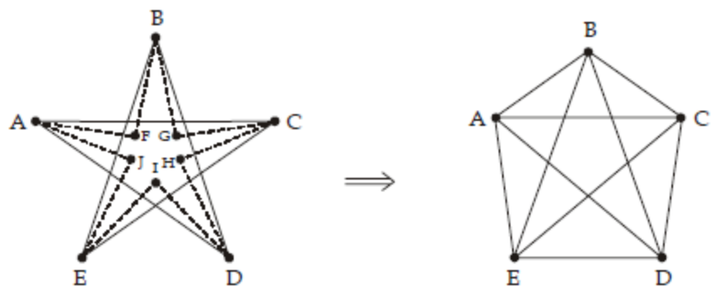
Solution :

1

Only G_3 is planar. G_3 is the well known 'n cube', now let's see why G_1 and G_2 are nonplanar. G_2 is nonplanar because it is homomorphic to $K_{3,3}$.

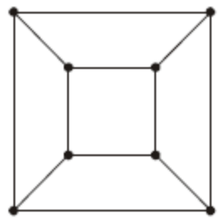
Therefore G_2 is nonplanar.

Similarly we can apply FES on G_1 as well (fuse $\frac{\text{AF} - \text{BF}}{\text{(to get AB)}}, \frac{\text{BG} - \text{CG, etc.}}{\text{(to get BC)}}$).



Therefore G_1 is also nonplanar, as it is homeomorphic to K_5 as shown above.

G_3 is planar (n-cube) here $n = 3$, for which we have a planar embedding.



Therefore only G_3 is planar.

$\therefore$ Number of planar graph = 1

Your Answer is 2

QUESTION ANALYTICS +

Q. 60

The minimum number of nodes (both leaf and non leaf) of B+ tree index required for storing 5500 keys and order of B+ tree is 8 _____.
(Order is max pointers a nods can have)

Have any Doubt ?

901 Correct Option

Solution :

901

Leaf node = 7 key + 1 block pointer

Non leaf node = 8 child pointer

For 5500 key $= \left\lceil \frac{5500}{7} \right\rceil = 786$ nodes

786 child pointer $= \left\lceil \frac{786}{8} \right\rceil = 99$ nodes

99 child pointer $= \left\lceil \frac{99}{8} \right\rceil = 13$ nodes

13 child pointer $= \left\lceil \frac{13}{8} \right\rceil = 2$ nodes

2 child pointer = 1 node

$786 + 99 + 13 + 2 + 1 = 901$ nodes

Your Answer is 32768

QUESTION ANALYTICS +

Q. 61

Let the difference between maximum possible profit for 0/1 Knapsack and fractional Knapsack problem with capacity (W) = 20 be X. Then the value of 5X will be

Item	a	b	c	d	e	f	g	h	i	j

Weight	3	5	2	1	12	10	9	9	4	1
Profit	7	10	3	3	26	19	18	17	5	4

Have any Doubt ?

15 Correct Option

Solution :
15

Fractional Knapsack problem:

Select all of item '*a*', '*d*', '*e*', '*j*' and 1/3 of item 'g'

Total weight = 3 + 1 + 12 + 1 + 1/3 + 9 = 20

Total profit = 7 + 3 + 26 + 4 + 1/3 × 18 = 46

0/1 Knapsack problem:

Select all of item *j*, *d*, *a*, *e* and *c*.

Total weight = 2 + 1 + 1 + 3 + 12 = 19

Total profit = 7 + 3 + 26 + 4 + 3 = 43

Difference = Total profit (using fractional Knapsack – Using 0/1 Knapsack)

= 46 – 43 = 3

$\Rightarrow$ 5X = 3 × 5 = 15

QUESTION ANALYTICS

Q. 62

Consider a system with 3-level paging with TLB support. TLB access time is 10 ns while main memory access time is 150 ns. If the CPU found 420 page reference in TLB out of total 500 page reference. What is the effective memory access time _____. (ns)

Have any Doubt ?

232 Correct Option

Solution :
232

$$\text{TLB hit ratio} = \frac{420}{500} = 0.84$$

System uses 3-level paging

TLB access time; Main memory access time; 3 level paging

$$\text{Effective memory access time} = x\,(t + m) + (1 - x)\,(t + 4\,m)$$

$$= 0.84\,(10 + 150) + 0.16\,(10 + 600)$$

$$= 0.84\,(160) + 0.16\,(10 + 600)$$

$$= 134.4 + 97.6 = 232 \text{ ns}$$

Your Answer is 104.4

QUESTION ANALYTICS

Q. 63

Consider the following statements:
S_1 : Hidden node problem in IEEE802.11 can be eliminated by the use of Handshake frames (RTS and CTS).
S_2 : IPV_6 does not support broadcasting but IPV4 supports broadcasting.
S_3 : DHCP server is necessary for IPV6 protocol.
The number of correct statements are _____.

Have any Doubt ?

2 Correct Option

Solution :
2

- Only S_1 and S_2 are correct.
- S_3 is wrong because IPV_6 supports both state full and state less auto configuration mode of its host devices. So, the absence of DHCP server does not create any problem. So, DHCP does not necessary for IPV_6.

Your Answer is 3

QUESTION ANALYTICS

Q. 64

Matrix *A* has x rows and $x + 5$ columns. Matrix B has y rows and 11-y columns. If it is known that both *AB* and *BA* exist, the value of $x^2 - y$ is _____.
(Upto 2 decimal places)

Have any Doubt ?

1.00 Correct Option

Solution :
1.00

Order of matrix, $A = x \times (x + 5)$

Order of matrix, $B = y \times (11 - y)$

For AB matrix to exist,

Number of column of A = Number of rows of B

$\Rightarrow x + 5 = y$

$y - x = 5$ ...(i)

For *BA* matrix to exist,

Number of columns of B = Number of rows of A

$\Rightarrow 11 - y = x$

$x + y = 11$ ...(ii)

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

$$y = 8$$

$$\therefore \quad x^2 - y = (3)^2 - 8 = 9 - 8 = 1$$

QUESTION ANALYTICS

Q. 65

A dice is tossed thrice. A success is getting '1 or 6' on a toss. Find the variance of number of successes _____. (Upto 2 decimal places)

Have any Doubt ?

0.66 (0.66 - 0.67)

0.66

Your answer is **Correct**

Solution :

0.66 (0.66 - 0.67)

$$\text{Probability of a success} = \frac{2}{6} = \frac{1}{3}$$

For Binomial distribution,

$$\sigma_x^2 = np(1-p)$$

$$= 3 \cdot \frac{1}{3}\left(1 - \frac{1}{3}\right) = \frac{2}{3}$$

$$= 0.667$$

QUESTION ANALYTICS