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Computer Science Engineering(CS)

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FULL SYLLABUS TEST-3 (BASIC LEVEL) GATE 2019 - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(65) | CORRECT(35) | INCORRECT(10) | SKIPPED(20)

Q. 1

Choose the correct meaning of proverb/idiom given below
'To catch a tartar'

Solution Video | Have any Doubt ?

A Become desperate

B To catch an innocent person

C To return to place of rest

D To catch a dangerous person — Your answer is **Correct**

Solution :
(d)

QUESTION ANALYTICS +

Q. 2

North Korea's economy contracted in the sharpest rate in two decades in 2017.
Which part of the sentence is grammatically incorrect?

Solution Video | Have any Doubt ?

A North Korea's economy

B contracted in the sharpest rate — Correct Option

Solution :
(b)
'contracted at the sharpest rate' instead of 'contracted in the sharpest rate'.

C in two decades in 2017 — Your answer is **Wrong**

D no error

QUESTION ANALYTICS +

Q. 3

Choose the word which is exact opposite of QUIESCENT.

Solution Video | Have any Doubt ?

A Spiritual

B Truthful

C Active — Your answer is **Correct**

Solution :
(c)

D Average

QUESTION ANALYTICS +

Q. 4

One fair coin is tossed four times, the probability that three heads and one tails will appear is

Solution Video | Have any Doubt ?

A $\frac{1}{4}$ — Your answer is **Correct**

Solution :
(a)
Sample space, S is {HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT} i.e. 16.
Favourable cases, P have been underlined above i.e. {HHHT, HHTH, HTHH, THHH} i.e. 4.

$$\text{Required probability} = \frac{P}{S} = \frac{4}{16} = \frac{1}{4} \text{ i.e. (a)}$$

B $\frac{1}{2}$

C $\frac{2}{}$

5

D $\frac{3}{4}$

QUESTION ANALYTICS

Q. 5

The next term in the series is
8, 20, 40, 68, 104, _____

Solution Video | Have any Doubt ?

148 — Your answer is **Correct**148

Solution :
148
$2^2 + 4, 4^2 + 4, 6^2 + 4, 8^2 + 4, 10^2 + 4, 12^2 + 4$

QUESTION ANALYTICS

Q. 6

If N = 1! + 3! + 5! + 7! ..... 199! then remainder obtained when N is divided by 120 is

Solution Video | Have any Doubt ?

A 7 — Correct Option

Solution :
(a)
5! onwards every factorial will be a multiple of 120. As 5! = 120

$6! = 5! \times 6$

$7! = 5! \times 6 \times 7$ and so on

So, remainder will be 1! + 3! = 7

B 9

C 11

D 13

QUESTION ANALYTICS

Q. 7

A merchant marks his goods, such that the profit on sale of 500 articles is equal to the selling price of 300 articles. The profit percentage is

Solution Video | Have any Doubt ?

A 50%

B 75%

C 100%

D 150% — Correct Option

Solution :
(d)
Let the selling price of an article be = ₹ (SP)
Let the cost price of an article be = ₹ (CP)

$$\text{Profit} = 300\,SP = 500\,(SP - CP)$$
$$300\,SP = 500\,SP - 500\,CP$$
$$500\,CP = 200\,SP$$
$$\frac{5}{2} = \frac{SP}{CP}$$

$$\text{Profit percentage} = \left(\frac{SP}{CP} - 1\right) \times 100 = 150\%$$

QUESTION ANALYTICS

Q. 8

Ankit can complete a work in 10 days, Bhanu in 12 days and Chinmoy in 15 days. All of them began the work together, but Ankit had to leave after 2 days and Bhanu 3 days before the completion of the work. The total number of days in which the work got finished is

Solution Video | Have any Doubt ?

A 5

B 7 — Correct Option

Solution :
(b)
First 2 days, all three of them worked together, thus they did $2 \times \left(\frac{1}{10} + \frac{1}{12} + \frac{1}{15}\right) = \frac{1}{2}$ of the work.
Last 3 days, only Chinmoy worked, thus he did $\frac{3}{15} = \frac{1}{5}$ of the work.
$1 - \frac{1}{2} - \frac{1}{5} = \frac{3}{10}$ of the work was done by Bhanu and Chinmoy
Time × Combined rate = Job done

$$\Rightarrow \quad t\times\left(\frac{1}{12}+\frac{1}{15}\right) = \frac{3}{10}$$

$$\Rightarrow \quad t = 2 \text{ days}$$

So, Bhanu and Chinmoy worked together for 2 days.

Total days $= 2+3+2=7$

C 9

D 10

QUESTION ANALYTICS +

Q. 9

A packet of 20 batteries is known to include 4 batteries that are defective. If 8 batteries are randomly chosen and tested, the probability of finding among them not more than 1 defective battery is

Solution Video | Have any Doubt ?

A 0.5033 — Your answer is **Correct**

Solution :

(a)

Probability of choosing a defective battery $= \frac{4}{20}=\frac{1}{5}$

Probability of choosing a non-defective battery $= 1-\frac{1}{5}=\frac{4}{5}$

p(not more than 1 out of 8) = p (0 defective out of 8) + p (1 defective out of 8)

$$= {}^8C_0\left(\frac{1}{5}\right)^0\left(\frac{4}{5}\right)^8 + {}^8C_1\left(\frac{1}{5}\right)^1\left(\frac{4}{5}\right)^7$$

$$= \frac{4^8}{5^8}+\frac{8.4^7}{5^8}=\frac{196608}{390625}=0.5033$$

B 0.4905

C 0.5125

D 0.5205

QUESTION ANALYTICS +

Q. 10

A man can row 100 km upstream and 144 km downstream in 18 hours. He can also row 140 km upstream and 180 km downstream in 24 hours. The rate of current is _____ km/hr.

Solution Video | Have any Doubt ?

4 — Correct Option

Solution :

4

Let speed of boat in still water = x km/hr

Let speed of water current = y km/hr

$$\frac{100}{x-y}+\frac{144}{x+y} = 18$$

$$\frac{140}{x-y}+\frac{180}{x+y} = 24$$

Let $\frac{1}{x-y} = a$ and $\frac{1}{x+y} = b$

Solving for a and b

$$a = \frac{1}{10}$$

$$b = \frac{1}{18}$$

Solving for x and y

$$x = 14 \text{ km/hr}$$

$$y = 4 \text{ km/hr}$$

QUESTION ANALYTICS +

Q. 11

Consider the following statements:
(i) Master-slave flip-flop is designed to avoid the race around condition.
(ii) Race around condition occurs in J-K flip-flop where J = 1 and K = 1.
(iii) Master-slave flip-flop is used to store 2-bits of information.
Which of the above statements are correct?

Have any Doubt ?

A (i) and (ii) only — Your answer is **Correct**

Solution :
(a)
Statements (i) and (ii) are correct.

B (ii) and (iii) only

C (i) and (iii) only

D All of the above

QUESTION ANALYTICS +

Q. 12

Which of the following is not an operator grammar? (Where S, A, B are non terminals and a, b are terminals)

(i) $S \rightarrow AaB$
$A \rightarrow a \mid \in$

(ii) $S \rightarrow Aa$

(iii) $S \rightarrow AB$
$A \rightarrow aA \mid a$

(iv) $S \rightarrow Ba$
$B \rightarrow b \mid Ba$

Have any Doubt ?

A (i) and (ii) only

B (i), (iv) and (iii) only

C (i) and (iii) only — Your answer is **Correct**

Solution :
(c)
In operator grammar, it does not contain adjacent non terminals and no production is $\in$.
So (i) and (iii) does not follow these properties.

D (i) and (iv) only

QUESTION ANALYTICS +

Q. 13

In a binary minheap containing n integers, the largest element can be found in time proportional to

Have any Doubt ?

A $O(\log n)$

B $O(n^{1/2})$

C $O(n)$ — Correct Option

Solution :
(c)
In a binary min heap, the maximum element will be present in the leaves.
Since the leaf nodes can be as many as $\frac{n}{2}$, we need to spend at least $O(n)$ time to find the maximum element.
Hence option (c) is correct.

D $O(n^2)$

QUESTION ANALYTICS +

Q. 14

Which of the following assertion is true about link state routing?

Have any Doubt ?

A LSP packet contains information of the network.

B LSP packet is forwarded using flooding algorithm.

C Routers in the network converted into tree before forwarding LSP packet.

D All of the above — Correct Option

Solution :
(d)
All statements are correct.

QUESTION ANALYTICS +

Q. 15

Which of the following derivations does a bottom up parser use while parsing an input string?
(The input is assumed to be scanned in left to right order)

Have any Doubt ?

A Left most derivation

B Left most derivation traced out in reverse — Your answer is **Wrong**

C Right most derivation traced out in reverse — Correct Option

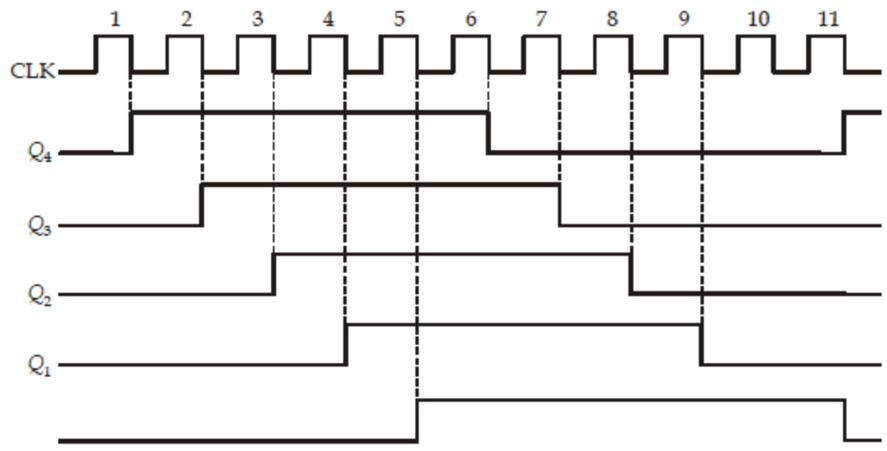
Solution :
(c)
Bottom up parser follows right most derivation traced out in reverse. So option (c) is correct.

D Right most derivation

QUESTION ANALYTICS

Q. 16

The output waveforms of a counter circuit shown below:



The counter is

Have any Doubt ?

A Ring counter

B Johnson counter — Your answer is **Correct**

Solution :
(b)

Q_4	Q_3	Q_2	Q_1	Q_0
0	0	0	0	0
1	0	0	0	0
1	1	0	0	0
1	1	1	0	0
1	1	1	1	0
1	1	1	1	1
0	1	1	1	1
0	0	1	1	1
0	0	0	1	1
0	0	0	0	1
0	0	0	0	0

The above waveform is of Johnson counter.

C Ripple counter

D Synchronous BCD counter

QUESTION ANALYTICS

Q. 17

Let G_1 and G_2 be two subgroups of G. Consider the following statements:

I. $G_1 \cup G_2$ is a subgroup of G.

II. $G_1 \cap G_2$ is a subgroup of G.

Which of the above statements is/are always true?

Have any Doubt ?

A Both I and II

B I only

C II only — Your answer is **Correct**

Solution :
(c)

$G_1 \cap G_2$ is always a subgroup of G, however $G_1 \cup G_2$ need not be.

D None of these

QUESTION ANALYTICS

Q. 18

Consider the following statements given below:

S_1 : A clustered index may be either sparse or dense.

S_2 : Every B^+ tree index is dense.

Which of the above statements is/are true?

Have any Doubt ?

A Both S_1 and S_2

B Only S_1 — Your answer is **Correct**

Solution :
(b)

S_1: A clustered index may be either sparse or dense. S_1 true

S_2: B^+ tree index may be dense or sparse. S_2 false

So option (b) is correct.

C Only S_2

D None of the above

QUESTION ANALYTICS

QUESTION ANALYTICS

Q. 19

Consider the following statements:
(i) Execution time for single instruction on six stage pipelined CPU is less than or equal to identical non-pipelined CPU.
(ii) In a uniform delay pipeline execution time for a single instruction is equal to the execution time in non-pipelined processor.
Which of the above statements are correct?

Have any Doubt ?

A Only (i)

B Only (ii) — Correct Option

Solution :
(b)
(i) For a single instruction time taken on pipelined CPU is greater than or equal to the identical non-pipeline.
(ii) When all stages of pipeline having same delay and buffer latency is zero then, for a single instruction execution time of pipeline CPU is equal to the execution time of non-pipelined CPU.

C Both (i) and (iii) — Your answer is **Wrong**

D Neither (i) nor (ii)

QUESTION ANALYTICS

Q. 20

Assume in TCP client is sending segment to server. After successfully receiving segments from client, server is waiting for next segments and clients is also waiting for acknowledgment from the server and this lead to deadlock situation. Which timer is used and who will initiate the probe segment to resolve this deadlock respectively?

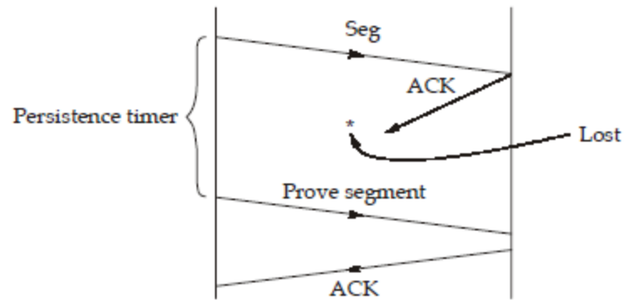
Have any Doubt ?

A Keep alive timer, server — Your answer is **Wrong**

B Retransmission timer, client

C Persistent timer, client — Correct Option

Solution :
(c)
Persistent timer will be used and probe segment is issued by client to resolve this deadlock as shown below:



D Keep alive timer, client

QUESTION ANALYTICS

Q. 21

Which of the following is correct about monitors?

Have any Doubt ?

A Prevents multiple process from executing monitor code at the same time. — Correct Option

Solution :
(a)
Monitor uses condition variables, prevents multiple processes from executing monitor code at the same time.
It hides the mutual exclusion details from calling function. Processes can not access the monitor's data from procedures declared outside the monitor.

B Mutual exclusion details are not abstracted from calling routine.

C Process can access the monitor's data (variables) from procedures declared outside the monitor.

D Both (a) and (c)

QUESTION ANALYTICS

Q. 22

A 3 × 8 decoder with two enable inputs is to be used to address 8 blocks of memory. What will be the size of each memory block when addressed from a sixteen bit bus with two MSBs used to enable the decoder?

Have any Doubt ?

A 2 K

B 4 K

C 16 K — Your answer is **Correct**

Solution :
(c)
As two MSBs used to enable the decoder logic remaining bits address the memory.

D 64 K

QUESTION ANALYTICS +

Q. 23

Let M be a finite automata. Let M′ denote the machine obtained by interchanging the final and non final states in the machine M.

I. $L(M) \cup L(M') = \Sigma^*$

II. $L(M) \cap L(M') = \phi$

What is the validity of the above statements with respect to DFAs and NFAs?

Have any Doubt ?

A I and II always hold for both DFA as well as NFA

B I and II always hold for DFA but never hold for NFA

C I and II always hold for DFA, but may or may not hold for NFA — Your answer is **Correct**

Solution :
(c)
I and II always holds for DFA, as L(M′) is same as [L(M)]′. However the same is not true for NFA.

D None of these

QUESTION ANALYTICS +

Q. 24

Which of the following best characterizes about memory mapped I/O?

Have any Doubt ?

A Additional hardware for bus is required to control the I/O bus and memory bus.

B Some of the address space is separated from the memory space and assigned them to I/O ports. — Correct Option

Solution :
(b)
Memory mapped I/O uses common bus and common control signals but having unique address space for I/O ports.

C Common bus is used but to differentiate between memory and I/O different control signals is used for memory and I/O. — Your answer is **Wrong**

D None of the above

QUESTION ANALYTICS +

Q. 25

Consider the string w = "PICHAI".Which of the following is not a valid suffix of w?

Have any Doubt ?

A CHAI

B PICHAI

C $\in$

D IAH — Your answer is **Correct**

Solution :
(d)
All are valid except option (d).

QUESTION ANALYTICS +

Q. 26

Consider the following code segment:

$p \rightarrow q + r$
$s \rightarrow p / t$
$p \rightarrow s * u$
$s \rightarrow s * p$

The minimum number of total variables required to convert the above code segment in three address code static single assignment form is _____.

Have any Doubt ?

8 — Your answer is **Correct**8

Solution :
8
In static single assignment form every variable is assign once and that variable can be used any number of times in R.H.S. side.

$t_1 = q + r$
$t_2 = t_1 / t$
$t_3 = t_2 * u$

t_1, t_2, t_3, t_4 q, r, t, u total 8 variables required.

QUESTION ANALYTICS

Q. 27

The order of a leaf node in a B+ tree is the maximum number of (value, record pointer) pairs it can hold. Given that the block size is 1024 bytes, record pointer is 9 byte long, the value field is 13 bytes long and block pointer is 8 bytes long. The order of the leaf node is _____.

Have any Doubt ?

46

Your answer is **Correct**46

Solution :
46

Let order of the leaf node is n.

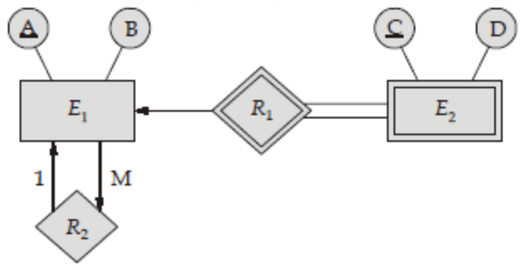
$$\begin{aligned} \text{Block size} &= 1024 \text{ byte} \\ (9+13)n + 8 &\le 1024 \\ 22n + 8 &\le 1024 \\ 22n &\le 1016 \\ n &\le 46.18 \\ n &= 46 \end{aligned}$$

Order of leaf node is 46.

QUESTION ANALYTICS

Q. 28

Consider the following ER diagram:



The minimum number of RDBMS tables required for the above ER diagram is _____.

Have any Doubt ?

2

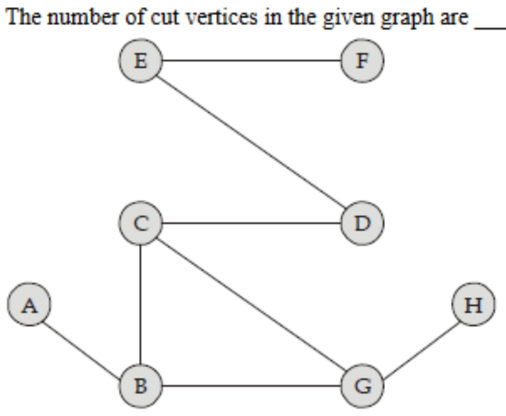
Your answer is **Correct**2

Solution :
2
E_1R_2(A, B) ...(1)
E_1R_1(A,C, D) ...(2)
2 tables required.

QUESTION ANALYTICS

Q. 29

The number of cut vertices in the given graph are _____.



Have any Doubt ?

5

Your answer is **Correct**5

Solution :
5
B, G, C, D, E are the vertices which can disconnect the graph if deleted. Therefore the answer is 5.

QUESTION ANALYTICS

Q. 30

A cache memory is 30 times faster than main memory (MM) and 50% of the time cache is referred for the execution of instruction. The performance is gained by introducing this cache is _____.
(Upto 2 decimal places)

Have any Doubt ?

1.96 (1.90 - 1.97)

Correct Option

Solution :
1.96 (1.90 - 1.97)

Apply Amdhal's law

$$\begin{aligned} S &= 30 \\ F &= 50\% = 0.5 \end{aligned}$$

$$S_{overall} = \left[\frac{1}{(1-F)+\frac{F}{S}}\right] = \left[\frac{1}{(1-0.5)+\frac{0.5}{30}}\right]$$

$$= \left[\frac{1}{0.5+0.016}\right] = \left[\frac{1}{0.51}\right] = 1.96$$

QUESTION ANALYTICS

Q. 31

The number of unlabelled binary trees with 3 nodes is equal to _____.

Have any Doubt ?

5 — Your answer is **Correct**5

Solution :
5

Number of unlabelled binary trees with n nodes is equal to $\frac{^{2n}C_n}{(n+1)}$.

Putting n = 3, we get 5 as the answer.

QUESTION ANALYTICS

Q. 32

Consider the following C program:

```
#include <stdio.h>
int main(void)
{
extern int i;
i = 1024;
printf("%d", i);
}
```

Consider the following statements with respect to the above C program.
1. The program throws linker error: Undefined reference to 'i'.
2. The program outputs 1024.

The correct statement (out of 1 and 2) is _____.

Have any Doubt ?

1 — Correct Option

Solution :
1

Extern int i; instructs the compiler that the memory for i is allocated in some other program and that address will be given to the current program at the time of linking. But linker finds that no other variable of name 'i' is available in any program with memory space allocated for it.
Hence linker error occurs.

QUESTION ANALYTICS

Q. 33

Let p be a char pointer. Consider the following statements:

I. $p[i] = *(i + p)$
II. $i[p] = *(p + i)$
III. $p + i = \&(i[p])$

The number of correct statements are _____.

Have any Doubt ?

3 — Your answer is **Correct**0

Solution :
3

All the statements are correct.
For I and II, $p[i] = *(p + i) = *(i + p) = i[p]$
For III:
The expression $(p + i)$ can be written as $(i + p) = \&(*(i + p)) = \&(i[p])$
Hence all 3 statements are correct.

QUESTION ANALYTICS

Q. 34

A boolean function g of two variables x and y is defined as follows:

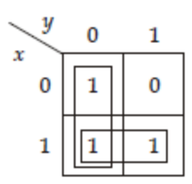
$g(0, 0) = g(1, 1) = g(1, 0) = 1, g(0, 1) = 0$

The minimum cost for realizing g using only 2-input NAND gates (each gates having unit cost) would have a total cost of _____ (unit cost).

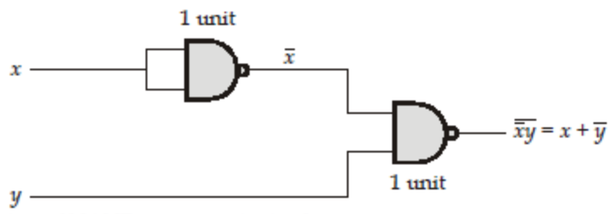
Have any Doubt ?

2 — Correct Option

Solution :
2



$g(x, y) = x + \overline{y}$



Minimum number of NAND gates required = 2.
Hence 2 unit cost will be the answer.

QUESTION ANALYTICS +

Q. 35

The access time of a cache memory is 100 ns and that of main memory is 1 µsec. 80% of the memory requests are for read and others are for write. Hit ratio for read only accesses is 0.9. A write through procedure is used. The average access time of the system for both read and write requests is _____ (in ns).

Have any Doubt ?

352 — Correct Option

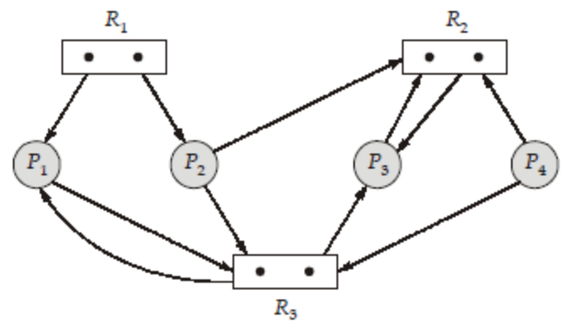
Solution :
352

$$\text{Read Access Time} = HT_c + (1 - H)(T_m)$$
$$= 0.9 \times 100 + 0.1 \times (1000)\ \text{nsec} = 190\ \text{nsec}$$
$$\text{Total Access Time} = (0.8 \times 190 + 0.2 \times 1000)\ \text{nsec} = 352\ \text{nsec}$$

QUESTION ANALYTICS +

Q. 36

Consider the following resources allocation graph with four processes P_1, P_2, P_3, P_4 and three resources R_1, R_2, R_3. System has two instances of resources R_1, two instances of resources R_2 and two instances of resources R_3.



Which of the following statement is correct for the above system?

Have any Doubt ?

A. No safe sequence exist.

B. Exactly two safe sequence

C. Exactly one safe sequence exists.

D. More than two safe sequence exists. — Your answer is **Correct**

Solution :
(d)

Process	Allocated			Need		
	R_1	R_2	R_3	R_1	R_2	R_3
P_1	1	0	1	0	0	1
P_2	1	0	0	0	1	1
P_3	0	1	1	0	1	0
P_4	0	0	0	0	1	1

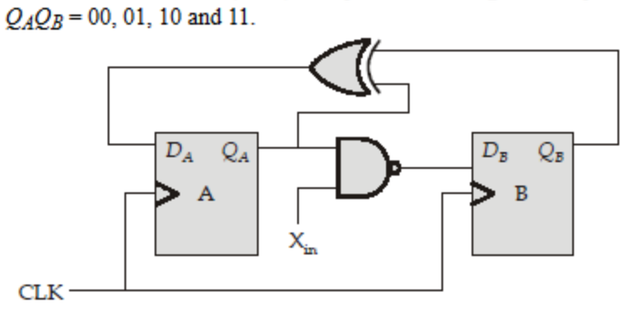
$R_1\ R_2\ R_3$
Available = (0 1 0)

P_3 need = (0, 1, 0) so P_3 can execute after that available resources (0, 2, 1)
Now anyone of P_1 or P_2 or P_4 can execute so more than two safe sequence exists.

QUESTION ANALYTICS +

Q. 37

A Finite State Machine (FSM) is implemented using the D flip-flops A and B with logic gates as shown below. The four possible states of the FSM are Q_AQ_B = 00, 01, 10 and 11.



Assume that X_{in} is held at constant logic level throughout the operation of the FSM. Where the FSM is initialized to the Q_AQ_B = 00 and clocked, after a few clock cycles, it starts cycling through.

Have any Doubt ?

A. All of the four possible states if $X_{in} = 1$

B. Only two of the four possible states if $X_{in} = 0$ — Your answer is **Correct**

Solution :
(b)
In the given diagram,

$$D_A = Q_A \oplus Q_B$$
and $$D_B = \overline{Q_A X_{in}}$$
For $$X_{in} = 0$$
$$D_A = Q_A \oplus Q_B$$
and $$D_B = 1$$

Q_A	Q_B	D_A	D_B	Q_A^+	Q_B^+
0	0	0	1	0	1
0	1	1	1	1	1

1	0	0	1	0	1
0	1	1	1	1	1

So, for $X_{in} = 0$, number of possible states = 2

C Only two of the four possible states if $X_{in} = 1$

D All of the four possible states if $X_{in} = 0$

QUESTION ANALYTICS +

Q. 38

Consider the following relations given below:
Supply (sid, sname)
Part (pid, pname, color)
Catalog (sid, pid)
What does the following SQL query return?

```
SELECT C.pid FROM Catalog C WHERE
    EXISTS (SELECT C1.sid FROM Catalog
        C1 WHERE C1.pid = C.pid AND
            C1sid ≠ C.sid)
```

Have any Doubt ?

A It gives the pids of Part supplied by two suppliers.

B It gives the pids of Part supplied by at atleast two suppliers.

C It gives the pids of Part supplied by atleast two different suppliers. Your answer is **Correct**

Solution :
(c)
The SQL query return the pids of Part supplied by atleast two different suppliers. So option (c) is correct.

D It gives the pids of Part supplied by atmost two different suppliers.

QUESTION ANALYTICS +

Q. 39

The value of the integral $\int\left[e^x \ln x + \frac{e^x}{x}\right]dx$ will be equal to

Have any Doubt ?

A $\frac{e^x}{x} + C$

B $\frac{xe^x}{\ln x} + C$

C $\frac{xe^x}{(1+\ln x)} + C$

D $e^x \ln x + C$ Correct Option

Solution :
(d)
We know,

$$\int e^x (f(x) + f'(x)dx = e^x f(x) + C$$

Here $f(x) = \ln x, f'(x) = \left(\frac{1}{x}\right)$

$$\int\left[e^x \ln x + \frac{e^x}{x}\right]dx = \int e^x\left(\ln x + \frac{1}{x}\right)dx = e^x \ln x + C$$

So option (d) is the correct choice.

QUESTION ANALYTICS +

Q. 40

Let X and Y be two sets. Then $(X - Y) \cup (X \cap Y) \cup (\bar{X} \cap Y)$ is equal to

Have any Doubt ?

A X

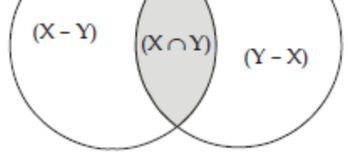
B $X \cup Y$ Your answer is **Correct**

Solution :
(b)
First let's simplify the expression a bit

$$= (X - Y) \cup (X \cap Y) \cup (\bar{X} \cap Y)$$

$$= (X - Y) \cup (X \cap Y) \cup (Y \cap \bar{X})$$

is same as, $(X - Y) \cup (X \cap Y) \cup (Y - X)$



Therefore, according to Venn diagram, we can see that

$(X - Y) \cup (X \cap Y) \cup (Y - X) = X \cup Y$

Hence option (b) is correct.

C Y

D $X \cap Y$

QUESTION ANALYTICS +

Q. 41

Consider the following function foo( ).

```
void foo(int n)
{
    if (n <= 0) printf("Bye");
    else
    {
        printf("Hi");
        foo(n - 3);
        printf("Hi");
        foo(n - 1);
    }
}
```

Let $P(n)$ represent the recurrence relation indicating the number of times the print statement (both "Hi" and "Bye" included) is executed. Then which of the following is the best match for $P(n)$?

Have any Doubt ?

A $P(n) = P(n-1) + P(n-3) + 2$ for $n > 0$; 1 for $n = 0$ — Your answer is **Correct**

Solution :
(a)
Option (a) is the correct recurrence for number of times print statement is executed.

B $P(n) = P(n-1) + P(n-3) + 2$ for $n > 0$; 2 for $n = 0$

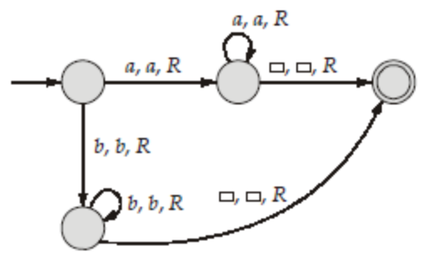
C $P(n) = P(n-1) + P(n-3) + 2$ for $n > 0$; 0 for $n = 0$

D $P(n) = P(n-1) + P(n-3) + 1$ for $n > 0$; 2 for $n = 0$

QUESTION ANALYTICS +

Q. 42

Consider the following Turing Machine T over the alphabet {a, b} and tape alphabet $\{a, b, \sqcup\}$.



The language accepted by the above Turing Machine T will be

Have any Doubt ?

A $\{a^n \mid n > 0\} \cup \{b^n \mid n > 1\}$

B $\{b^n \mid n \geq 1\} \cup \{a^n \mid n > 1\}$

C $\{a^n \mid n \geq 1\} \cup \{b^n \mid n \geq 0\}$

D $\{a^n \mid n \geq 1\} \cup \{b^n \mid n > 0\}$ — Correct Option

Solution :
(d)
The Turing Machine T accepts the regular language corresponding to the regular expression $aa^* + bb^*$. Hence the correct choice is option (d).

QUESTION ANALYTICS +

Q. 43

Let M denote the set of all lines in a plane. Let R and S be two relations on M defined such that,

$R = \{(a, b) \mid a \text{ is parallel to } b\}$

$S = \{(a, b) \mid a \text{ is perpendicular to } b\}$

Then which of the following is correct about R and S?

Have any Doubt ?

A Both R and S are equivalence relations.

B R is an equivalence relation, but S is not an equivalence relation. — Your answer is **Correct**

Solution :
(b)
Let's see why S is not an equivalence relation first.
The reason is that, S is not even reflexive, because $(a, a) \notin S$, since a line cannot be perpendicular

to itself.
But R is an equivalence relation. Let's check why.
Reflexive: $(a, a) \in R$, as a line is always parallel to itself.
Symmetric: $(a, b) \in R$ implies $(b, a) \in R$, because if a and b are parallel to each other, then parallelism holds both ways.
Transitive: If a is parallel to b, b is parallel to c, then a is parallel to c. Hence R is an equivalence relation.
So the correct choice is option (b).

C R is not an equivalence relation, but S is an equivalence relation.

D None of these

QUESTION ANALYTICS +

Q. 44

Given below are 4 functions, labelled I, II, III and IV.

I. $999999n$
II. $0.99999n \log n$
III. 1.000001^n
IV. n^2

The increasing order of the above functions in terms of their asymptotic complexity is

Have any Doubt ?

A I, IV, II, III — Your answer is **Wrong**

B I, II, III, IV

C II, I, IV, III

D I, II, IV, III — Correct Option

Solution :
(d)
(d) is the correct order.
Clearly III is the greatest, because it grows exponentially, even though it looks deceptive. Always remember, if the function is of the form c^n, where c is a constant > 1, such a function grows exponentially.
IV comes second, II is third, and I comes last. No mysteries here, as constants don't matter much in asymptotic analysis anyway.

QUESTION ANALYTICS +

Q. 45

An array A of size n is known to be sorted except for the first k elements and the last k elements, where k is a constant. Which of the following algorithms will be the best choice for sorting the array A?

Have any Doubt ?

A Quick Sort

B Bubble Sort

C Selection Sort

D Insertion Sort — Correct Option

Solution :
(d)
If we know beforehand that the array is almost sorted, then insertion sort is the best choice in order to sort such an array.
So (d) is the correct answer.

QUESTION ANALYTICS +

Q. 46

Consider the following New-order strategy for traversing a binary tree:
• Visit the root;
• Visit the right subtree using New-order;
• Visit the left subtree using New-order;
The New-order traversal of the expression tree corresponding to the reverse polish expression
3 4 * 5 - 2 ^ 6 7 * 1 + - is given by

Have any Doubt ?

A + - 1 6 7 * 2 ^ 5 - 3 4 * + - 1 6 7 * 2 ^ 5 - 3 4 *

B - + 1 * 6 7 ^ 2 - 5 * 3 4 - + 1 * 6 7 ^ 2 - 5 * 3 4

C - + 1 * 7 6 ^ 2 - 5 * 4 3 - + 1 * 7 6 ^ 2 - 5 * 4 3 — Correct Option

Solution :
(c)
Reverse polish expression is another name for postfix notation. Since postfix notation is similar to postorder (LEFT, RIGHT, ROOT) and new order strategy is (ROOT, RIGHT, LEFT), both are reversals of each other.
Hence option (c) is the correct answer.

D 1 7 6 * + 2 5 4 3 * - ^ - 1 7 6 * + 2 5 4 3 * - ^ -

QUESTION ANALYTICS

Q. 47

Let $f: A \to B$ and $g: B \to C$ denote two functions. If the function $g \circ f: A \to C$ is a surjection and g is an injection, then function f is _____.

Have any Doubt ?

A Injection

B Surjection — Your answer is **Correct**

Solution :
(b)
$f: A \to B$

$g: B \to C$ is injection: $\forall b \in B, g(b) = c$ distinct images in C.

$g \circ f: A \to C$ is surjection

$$g(f(a)) = c$$
$$\Rightarrow \quad g(f(a)) = g(b)$$
$$\exists a \in A$$
$$\therefore \quad f(a) = b$$

So, $f: A \to B$ is surjection.

C Bijection

D None of these

QUESTION ANALYTICS

Q. 48

We define D-Tree(G) as the tree obtained by applying the DFS algorithm on a graph G. Consider the following statements regarding the same.
S_1 : If G is an undirected graph, then every edge in D-Tree(G) is either a tree edge or a back edge.
S_2 : If G is a undirected graph, then every edge in D-Tree(G) is either a tree edge, or a cross edge.
Which of the above statements are true?

Have any Doubt ?

A Both S_1 and S_2

B Only S_1 — Correct Option

Solution :
(b)
DFS of an undirected graph contains tree edges and back edges, but can never contain forward edges and cross edges. Hence S_1 is the only true statement.

C Only S_2

D None of these

QUESTION ANALYTICS

Q. 49

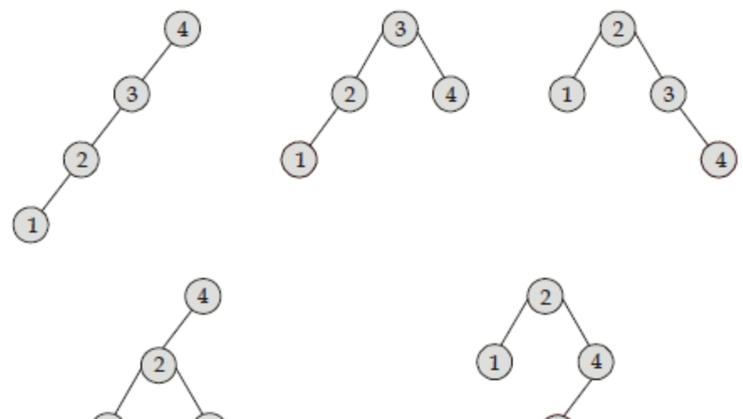
The number of binary search tree's with 4 nodes (1, 2, 3, 4) possible where in every binary search tree '1' is leaf node are

Have any Doubt ?

A 4

B 5 — Your answer is **Correct**

Solution :
(b)



∵ There are 5 binary search tree's are possible only.

C 6

D 3

QUESTION ANALYTICS

Q. 50

Which of the following is the best choice as m in the hash function $h(k) = k \bmod m$?

Have any Doubt ?

A 81

B 61

C 701 — Your answer is **Correct**

Solution :
(c)
For $h(k) = k \bmod m$, the best choice of m is the one which is a prime number such that it is not too close to a number which is a power of 2.
So option (d) is ruled out, as it is a power of 2.
Option (a) is not a prime number and (b) is very close to a power of 2 i.e. 26.
Option (c) is the correct choice as not only it is a prime number, but also out of the given choices, it is farthest away from a power of 2.

D 32

QUESTION ANALYTICS +

Q. 51

Consider the following schedules involving three transaction:

S_1: $r_1(x), r_2(z), r_1(z), r_3(x), r_3(y), w_1(x), w_3(y), r_2(y), w_2(z), w_2(y)$

S_2: $r_1(x), r_2(z), r_3(x), r_1(z), r_2(y), r_3(y), w_1(x), w_2(z), w_3(y), w_2(y)$

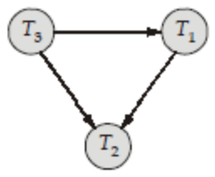
Which of the following schedules is conflict serializable?

Have any Doubt ?

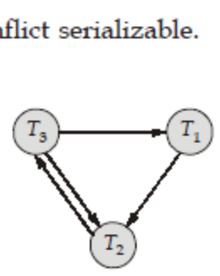
A Both S_1 and S_2 — Your answer is **Wrong**

B Only S_1 — Correct Option

Solution :
(b)
A schedule S is conflict serializable if the precedence graph of S does not contain any cycle.
Precedence graph of S_1.



It does not contain any cycle so conflict serializable.
Precedence graph of S_2



It contain cycle so not conflict serializable.
So option (b) is correct.

C Only S_2

D None of the above

QUESTION ANALYTICS +

Q. 52

Consider Dijkstra's algorithm in the link-state routing protocol at node u, Professor Ram first sets the route for each directly connected node v to be the link connecting u to v. Ram then implements the rest of the algorithm correctly, aiming to produce minimum-cost routes, but does not change the routes to the directly connected nodes. In this network, u has at least two directly connected nodes and there is more than one path between any two nodes. Assume that all link costs are non-negative. Which of the following statements is False of u's routing table?

Have any Doubt ?

A There are topologies and link costs where the majority of the routes to other nodes will be incorrect.

B There are topologies and link costs where no routing table entry (other than from u to itself) will be correct. — Correct Option

Solution :
(b)
(a) Is true since for example, all the neighbors but one could have very high cost, and all the other links have low cost, so all the routes could in fact be just one link.
(b) Is false since The lowest-cost neighbor's route will be the direct link, of course!
(c) Is true since A trivial example is when all the links have equal cost.

C There are topologies and link costs where all routing table entry (other than from u to itself) will be correct.

D Both (a) and (b)

QUESTION ANALYTICS +

Q. 53

Consider the following relations and SQL queries given below:
Sailors (sid, name, rating, age)

```
Query 1: SELECT S.name FROM Sailors S
         WHERE NOT EXISTS (SELECT * FROM
           Sailors S2 WHERE S2.age < 22
             AND S.rating < = S2 rating)
```

Query 2: SELECT S.name FROM Sailors S
WHERE S.rating > ANY (SELECT
S_2.rating FROM Sailors S_2 WHERE
S_2.age < 22)

Which of the above query is correct implementation of "Find the names of sailors with a higher rating than all sailors with age < 22"?

Have any Doubt ?

A Only query 1 — Your answer is **Correct**

Solution :
(a)
Query 2 returns the names of sailors with a higher rating than at least one sailor with < 22. In particular, if all are at least 22 years old, the query 2 will return an empty set while query 1 will return names of all the sailors.
NOT EXISTS evaluates to true if its subquery evaluates to an empty set, while ANY evaluates to false if it evaluates to an empty set.
Only query 1 is correct.

B Only query 2

C Both query 1 and query 2

D None of the above

QUESTION ANALYTICS

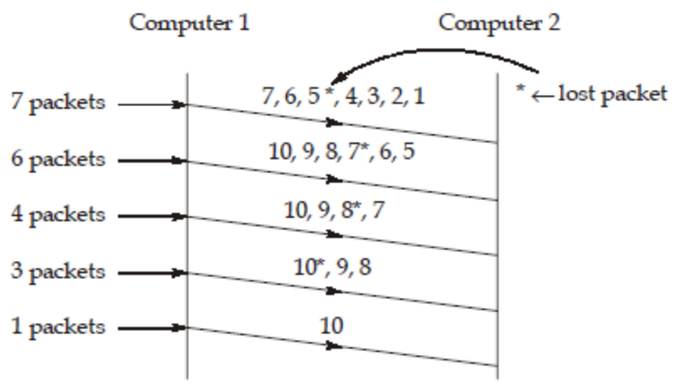
Q. 54

Assume 2 computers are connected via a network. The network uses GoBack-7 sliding window protocol for maintaining flow control. It is observed that every 5^{th} packet that has been sent through the network is lost. The number of extra packet needs to resend for transmitting 10 such packet through the network is _____.

Have any Doubt ?

11 — Correct Option

Solution :
11
In GB-7 maximum 7 packets can be in the window.
Assume packet through 1 to 10 needs to be send.
Then



So, total 21 packet is transmitted to successfully send 10 packets.
So, Extra packet = 21 – 10 = 11

Your Answer is 14

QUESTION ANALYTICS

Q. 55

Consider the following set of processes with the arrival times and burst times. Processes are scheduled using highest response ratio next.

Process	Arrival Time	Burst Time
P_0	0	4
P_1	2	1
P_2	4	3
P_3	5	5

(All time in milliseconds)

The average waiting time of processes are _____ (ms). (Upto 1 decimal place)

Have any Doubt ?

1.5 (1.49 - 1.52) — Your answer is **Correct** 1.5

Solution :
1.5 (1.49 - 1.52)
(i) At $t = 0$ P_0 will execute
(ii) At $t = 4$

$$RR_1 = \frac{2+1}{1} = 3 \quad \text{(highest } RR\text{)}$$

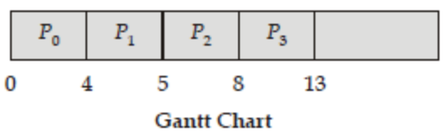
$$RR_2 = \frac{0+3}{3} = 1$$

P_1 will execute next
(iii) At $t = 5$

$$RR_2 = \frac{1+3}{3} = \frac{4}{3}$$

$$RR_3 = \frac{0+5}{5} = 1$$

P_2 will execute next then P_3 will execute



Gantt Chart

Waiting Time = Turn Around Time − Burst Time

P_0	0
P_1	2
P_2	1
P_3	3

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

$$= \frac{0+2+1+3}{4} = \frac{6}{4} = 1.5 \text{ ms}$$

QUESTION ANALYTICS

Q. 56

A hypothetical 5 stage pipeline processor is designed in which branch is predicted at 3rd stage and each stage takes 1 cycle to compute its task. If f is a the probability of an instruction being a branch instruction then the value of f such that speed up is atleast 3 is _____. (Upto 2 decimal places)

Have any Doubt ?

0.33 (0.30 - 0.33) — Correct Option

Solution :
0.33 (0.30 - 0.33)

$$r = \frac{t}{t_c} = \frac{0.21}{0.60} = 0.35$$

$$\phi = \tan^{-1}\left(\frac{r\cos\alpha}{1 - r\sin\alpha}\right) = \tan^{-1}\left(\frac{0.35\cos 20°}{1 - 0.35\sin 20°}\right)$$

$$\phi = 20.48°$$

$$\text{Shear strain, } \gamma = \cot\phi + \tan(\phi - \alpha)$$

$$= \cot 20.48° + \tan(20.48° - 20°)$$

$$\gamma = 2.6858$$

QUESTION ANALYTICS

Q. 57

Consider a system using demand paging architecture where it take 3 ms to service a page fault if either empty frame is available or replaced page is not to be modified and takes 10 ms if the replaced page is modified. Main memory access time is 1 ms and page to be replaced is modified 60% of the time. The maximum acceptable page fault rate to get the effective memory access time not more than 4 ms is _____ (%). (Upto 2 decimal places)

Have any Doubt ?

48.38 (48.37 - 48.39) — Correct Option

Solution :
48.38 (48.37 - 48.39)
Let P is the page fault rate

$$4 \text{ ms} \le P[0.6 \times 10 + 0.4 \times 3] + (1 - P)\ 1 \text{ ms}$$

$$4 \le P[6 + 1.2] + (1 - P)$$

$$4 \le 7.2P + 1 - P$$

$$3 \le 6.2\,P$$

$$P = 0.4838 \times 100$$

$$= 48.38$$

QUESTION ANALYTICS

Q. 58

A 2000 km long trunk is used to transmit 72 bytes frame and using GoBack-N protocol for the flow control. If the propagation speed is 7 μsec/km and bandwidth is 2 Mbps then the minimum number of bit required to represent N is _____.

Have any Doubt ?

7 — Correct Option

Solution :
7

$$\text{Propagation speed} = 7\ \mu\text{sec/km}$$

$$\text{Time required to travel 2000 km} = 2000 \times 7\ \mu\text{sec} = 14 \text{ msec}$$

$$\text{Round Trip Time (R.T.T.)} = 2 \times 14 \text{ msec} = 28 \text{ msec}$$

$$1 \text{ sec} \ldots\ldots\ldots\ldots 2 \times 10^6 \text{ bits}$$

$$28 \text{ msec} \ldots\ldots\ldots\ldots ?$$

$$= 28 \times 10^{-3} \times 10^6 \times 2 \text{ bits}$$

$$= 56000 \text{ bits}$$

$$\text{Number of frames} = \left\lceil \frac{56000}{72 \times 8} \right\rceil = 98 \text{ frames} = N$$

$$\text{Number of sequence bit required} = \lceil \log_2(1+N) \rceil = \lceil \log_2(1+98) \rceil$$

$$= 7 \text{ bit}$$

QUESTION ANALYTICS

Q. 59

Consider the following production 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}
$A \rightarrow B$	{A.val = B.val}
$B \rightarrow num$	{B.val = num}

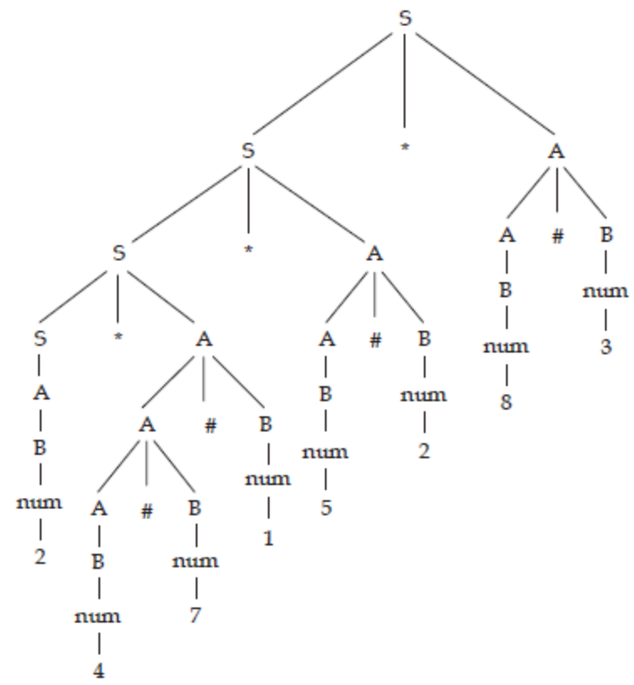
The output of 2 * 4 # 7 # 1 * 5 # 2 * 8 # 3 expression is _____.

Have any Doubt ?

-28

Your answer is **Correct**-28

Solution :
-28



Operation # will perform first because it has higher precedence than *
2 * 4 # 7 # 1 * 5 # 2 * 8 # 3
(((2 – ((4 + 7) + 1)) – (5 + 2)) – (8 + 3))
= ((2 – 12) – 7) – 11)
= (–10 – 7) – 11
= –17 – 11
= –28

QUESTION ANALYTICS

Q. 60

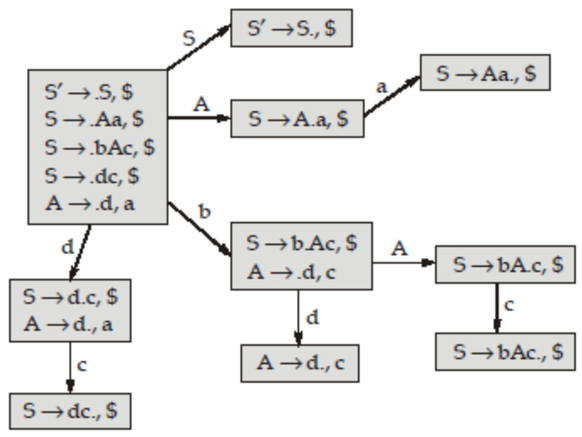
Consider the following grammar:
$S \rightarrow Aa \mid bAc \mid dc$
$A \rightarrow d$
(Where S and A are nonterminals and a, c, d are terminals)
Number of states in CLR(1) parser construction _____.

Have any Doubt ?

10

Correct Option

Solution :
10



Total number of states is 10.

Your Answer is 9

QUESTION ANALYTICS

Q. 61

Let T be a rooted binary tree whose vertices are labelled with symbols *a, b, c, d, e, f, g, h, i, j, k.*
Suppose the inorder (visit left subtree, visit root, visit right subtree) and post-order (visit left subtree, visit right subtree, visit root) traversals of T produce the following sequences.
In-order: *a, b, c, d, e, f, g, h, i, j, k*
Post-order: *a, c, b, e, f, h, j, k, i, g, d*
The number of leaves in T are _____.

Have any Doubt ?

5

Your answer is **Correct**5

Solution :
5
We can easily construct a unique binary tree from the Postorder and Inorder information given above. The leaf nodes will be *a, c, e, h, j*; and therefore number of leaves = 5.

QUESTION ANALYTICS

Q. 62

Consider the following C code:

```
#include <stdio.h>
int main(void)
{
    static int i = 6;
```

```
    if(--i)
    {
        main( );
        printf("%d", i + 1);
    }
    return 0;
}
```

Let X and Y denote the number of 0's and 1's printed by the above program. Then the value of 2X + Y will be equal to

Have any Doubt ?

5 — Your answer is **Correct**0

Solution :
5
Output will be 11111
No of 0's printed = 0, no of 1's printed = 5.
Therefore $2X + Y = 5$

QUESTION ANALYTICS

Q. 63

Let X and Y denote the chromatic number and the diameter of $K_{2019, 2019}$ respectively. Then the ratio $\left(\frac{X}{Y}\right)$ is equal to _____.

Have any Doubt ?

1 — Your answer is **Correct**1

Solution :
1
Since $K_{m, n}$ is bipartite, chromatic number = 2.
Diameter of $K_{2019, 2019} = 2$

Therefore, $\frac{X}{Y} = \frac{2}{2} = 1$

QUESTION ANALYTICS

Q. 64

Two dice marked 1 to 6 are tossed together. The probability of getting a sum of 7 in a single throw is _____. (Upto 2 decimal places)

Have any Doubt ?

0.166 (0.16 - 0.17) — 0.16
Your answer is **Correct**

Solution :
0.166 (0.16 - 0.17)
Favourable cases: (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)
Total cases: $6.6 = 36$

Required probability $= \frac{6}{36} = \frac{1}{6} = 0.166$

QUESTION ANALYTICS

Q. 65

Consider the following, five binary strings of length 8.
01010010, 11011011, 10011010, 11111011, 01110010
A hash table of size M = 8 (0 to 7) is using open addressing (initially empty) for hashing the binary strings. Also the hash function is given as $h(k) = k$ mod 8. Assume that finding an empty slot directly without collision or after collision is also counted as a probe. The total number of probes that occur while hashing the above 5 strings using linear probing are _____.

Have any Doubt ?

13 — Correct Option

Solution :
13
The point to note here is that, since the size is a power of 2 and the keys to be hashed are also given in binary, there's no need to convert it into decimal, as the least significant 3 bits will give the remainder when divided by 8, so keep all tips and tricks handy to save time in the actual GATE exam as well.
01010010 mod 8 = 010 = 2 (1 probe, goes to slot 2)
11011011 mod 8 = 011 = 3 (1 probe, goes to slot 3)
10011010 mod 8 = 010 = 2 (3 probes, goes to slot 4, unsuccessful probes at slots 2 and 3)
11111011 mod 8 = 011 = 3 (3 probes, goes to slot 5, unsuccessful probes at slots 3 and 4)
01110010 mod 8 = 010 = 2 (5 probes, goes to slot 6, unsuccessful probes at slots 2, 3, 4, and 5)
So, total number of probes = 13

Your Answer is 14

QUESTION ANALYTICS