

Q.1)

Let $G = (V, \Sigma, R, S)$, where $V = \{a, b, S\}$, $\Sigma = \{a, b\}$,
 $R = \{ S \rightarrow aSb, S \rightarrow aSa, S \rightarrow bSa, S \rightarrow bSb, S \rightarrow \epsilon \}$.

The language generated by the given grammar is



A Set of all even length palindromes over the alphabet {a,b}



B Set of all strings of a's and b's start with the same symbol



C Set of all strings of a's and b's start with the different symbol



D Set of all even length strings over the alphabet {a,b}

Correct Option

Solution: (D)

Explanation:

Given grammar is

$S \rightarrow aSb,$
 $S \rightarrow aSa,$
 $S \rightarrow bSa,$
 $S \rightarrow bSb,$
 $S \rightarrow \epsilon$

The strings that are generated by the given grammar is

$\{\epsilon, aa, ab, ba, bb, abaa, bbbb, \dots\}$

Set of all even length strings.

Q.2)

The number of ways in which a cricket team of 11 can be chosen from a batch of 15 so that one player is always excluded
is_____

Subject: Engineering-Mathematics

Max Marks: 1



Correct Answer

Solution: (364)

Solution: 364

If one player is always excluded then the number of ways we can make the choice is $C(14,11)=C(14,3)=364$.

Q.3)

Suppose TCP uses AIMD for its congestion control without slow start. Assuming cwnd increases by 2 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how long in round trip time does it take for cwnd to increase from 4 MSS to 12 MSS (assuming no loss events)?

Subject: Computer Networks

Max Marks: 1



Correct Answer

Solution: (4)

Explanation:

Current cwind is 4 MSS

We are increasing it by 2 MSS every time

First transmission: 4 MSS

Second transmission: 6 MSS

Third transmission: 8 MSS

Fourth transmission: 10 MSS

Fifth transmission: 12 MSS

It takes 4 RTT to increase the cwind from 4 MSS to 12 MSS.

Q.4)

```
#include <stdio.h>
int main()
{
    int i,j=5;
    i=1;
```

Subject: C Programming

Max Marks: 1

```

        i--;
        while(i+j<25)
        {
            if(j+i%4==11)break;
            if(i%2==0)
            {
                j /=2;
                i +=3;
            continue;
            }
            i--;
            j *=3;
        }
        printf("%d %d\n",i,j);
    }
}

```

A

5, 10

Correct Option

Solution: (A)

Initially i=1 and j=5

First Iteration ($i+j < 25$) \Rightarrow True
 \Rightarrow if ($j+i \% 4 == 11$) \Rightarrow ($5+1 \% 4 != 11$) Fails
 \Rightarrow if ($i \% 2 == 0$) \Rightarrow ($1 \% 2 != 0$) Fails

\Rightarrow Now $i=0$ and $j=15$
Second Iteration ($i+j < 25$) \Rightarrow True
 \Rightarrow if ($j+i \% 4 == 11$) \Rightarrow ($15+0 \% 4 != 11$) Fails
 \Rightarrow if ($i \% 2 == 0$) \Rightarrow ($0 \% 2 == 0$) True
 $\Rightarrow j=j/2 \Rightarrow j=7$
 $\Rightarrow i=i+3 \Rightarrow i=3$
Third Iteration ($3+7 < 25$) True
 \Rightarrow if ($j+i \% 4 == 11$) \Rightarrow ($7+3 \% 4 != 11$) Fails
 \Rightarrow if ($i \% 2 == 0$) \Rightarrow ($3 \% 2 != 0$) Fails
Now $i=2$ and $j=21$
Fourth Iteration ($2+21 < 25$) True
 \Rightarrow if ($j+i \% 4 == 11$) \Rightarrow ($21+2 \% 4 != 11$) Fails
 \Rightarrow if ($i \% 2 == 0$) \Rightarrow ($2 \% 2 == 0$) True
 $\Rightarrow j=j/2 \Rightarrow j=10$
 $\Rightarrow i=i+3 \Rightarrow i=5$
Fifth Iteration ($5+10 < 25$) True
 \Rightarrow if ($j+i \% 4 == 11$) \Rightarrow ($10+5 \% 4 != 11 \Rightarrow (10+1 == 11)$) True

Exit from the loop and print i,j $\Rightarrow 5, 10$

B

10, 5

C

5, 5

D

10, 10

Q.5)

Which of the following is/are decidable

- $L_1 = \{<M> \mid M \text{ is a Turing machine that rejects all inputs of even length.}\}$
- $L_2 = \{<M> \mid M \text{ is a Turing machine that halts on an empty input.}\}$
- $L_3 = \{<M> \mid \text{there is some input } x \in \{0,1\}^* \text{ such that } M \text{ accepts } x \text{ in less than 2020 steps.}\}$

A

I, II and III

B

II and III only

C

I and II only

D

III only

Subject: Theory of Computation, Compiler Design

Max Marks: 1

Solution: (D)

Explanation:

- $L_1 = \{<M> \mid M \text{ is a Turing machine that rejects all inputs of even length.}\}$

L_1 is undecidable. To see this, assume on the contrary that there exists some TM R_1 that decides L_1 , and we use R_1 to construct a TM S_1

that decides A_{TM} :

S1 = "On input $\langle M, w \rangle$:

1. Construct TM M1 that on input x, accept if $|x|$ is odd. If $|x|$ is even, it simulates M on input w. If M accepts w, M1 enters the reject state. If M rejects w, M1 enters the accept state. If M loops, M1 also loops.
2. Run R1 on input $\langle M1 \rangle$

3. Accept if R1 accepts, and reject if R1 rejects."

Observe that if M accepts w, then M1 is a Turing machine that rejects all inputs of even length. If M rejects or loops on input w, then M1 is a Turing machine that for each input of even length, either loops or accepts.

II. $L_2 = \{\langle M \rangle \mid M \text{ is a Turing machine that halts on an empty input}\}$

L_2 is undecidable. To see this, assume on the contrary that there exists some TM R2

that decides L_2 , and we use R2 to construct a TM S2 that decides

A_{TM} :

S2 = "On input $\langle M, w \rangle$:

1. Construct TM M2 that ignores its input and simulates M on input w and accept

(and halt) if M does. If M rejects w, M2 keeps moving right upon reading any input (thereby looping).

2. Run R2 on input $\langle M2 \rangle$.

3. Accept if R2 accepts, and reject if R2 rejects."

Observe that if M accepts w, then M2 is a Turing machine that halts on an empty input. If M rejects or loops on input w, then M2 is a Turing machine that loops on an empty input.

III. $L_3 = \{\langle M \rangle \mid \text{there is some input } x \in \{0,1\}^* \text{ such that } M \text{ accepts } x \text{ in less than 2020 steps}\}$

L_3 is decidable. First, observe that if $\langle M \rangle \in L_3$, then there exists some string x of length at most 2020 such that M accepts x in less than 2020 steps. This is because M cannot read beyond the 2020th position of its input in less than 2020 steps. Therefore, to check whether an input $\langle M \rangle$ is in L_3 , it suffices to simulate M over all strings of length at most 2020 for at most 2019 steps, and accept if M accepts one of these strings, and reject otherwise.

Q.6)

Consider the following proposition:

Subject: Discrete Mathematics

Max Marks: 1

$$\neg p \rightarrow (q \rightarrow r)$$

It is not equivalent to which of the below propositions?

A

$$(p \vee \neg q) \vee r$$

B

$$q \rightarrow (p \vee r)$$

C

$$p \vee (q \rightarrow r)$$

D

None of the above

Correct Option

Solution: (D)

Explanation :

$$\begin{aligned} \neg p \rightarrow (q \rightarrow r) &\equiv \neg \neg p \vee (q \rightarrow r) && [\text{Law of Implication}] \\ &\equiv p \vee (q \rightarrow r) && [\text{Double Negation}] \\ &\equiv p \vee (\neg q \vee r) && [\text{Law of Implication}] \\ &\equiv (p \vee \neg q) \vee r && [\text{Associativity}] \\ &\equiv (\neg q \vee p) \vee r && [\text{Commutativity}] \\ &\equiv \neg q \vee (p \vee r) && [\text{Associativity}] \\ &\equiv q \rightarrow (p \vee r) && [\text{Law of Implication}] \end{aligned}$$

Q.7

A DMA module is transferring data to memory using cycle stealing from a device that transmits data at rate of 19,200 bits per second. The speed of the CPU is 3 MIPS. By how much would the DMA module affect the performance of the CPU (Assume 8 bits per char or byte).

Subject: Computer Organization

Max Marks: 1

Correct Answer

Solution: (0.08)**Answer:** 0.08**Explanation:**

Device is transferring the data at 19200 bits per second.
 $19200/8 = 2400$ char per sec (by assuming 8 bit per char or byte).
 CPU Slow down due to DMA transfer = $(2400/3 * 10^6) * 100$
 $= (8 * 10^{-4}) * 100 = 8 * 10^{-2} = 0.08$

Q.8)

Which subnet mask would be appropriate for a network address range to be subnetted for up to eight LANs, with each LAN containing 5 to 26 hosts?

Subject: Computer Networks

Max Marks: 1

A

255.255.255.240

B

255.255.255.252

C

255.255.255.0

D

255.255.255.224

Correct Option

Solution: (D)**Explanation:**

We want 8 LANs or subnets so the subnet bits will be 3 is enough= $2^3 = 8$
 For max 26 hosts we need = 5 bits = $2^5 = 32$ addresses
 So the last octet of subnet mask should look like = 11100000= 224
 The octet 1st, 2nd and third will be the network bits.
 255.255.255.224 is the answer.

Q.9)

Consider the following statements :

Subject: operating systems

Max Marks: 1

- S1:** Locks can be implemented using semaphores.
S2 : A modern OS can regain control of the CPU from a user level program stuck in an infinite loop.

Which of the following options is/are not incorrect?

A

S1 is True, S2 is False

B

S2 is True, S1 is False

C

Both are True

Correct Option

Solution: (C)**Explanation:**

S1 :
 Initializing a semaphore with the value “1” will cause it to behave like a lock.
 Semi.P() acquire() and Semi.V() release().

S2 :
 Since we are talking about a user-level program, the timer interrupt handler (triggered by the timer) will enter the scheduler and recover the CPU from a program that is stuck in an infinite loop.

D

Both are False

Q.10)

Subject: Discrete Mathematics

Max Marks: 1

Consider the poset $(\{3,5,9,15,24,45\}, |)$, where $|$ is the divisibility relation.

The number of maximal elements are _____

Correct Answer

Solution: (2)

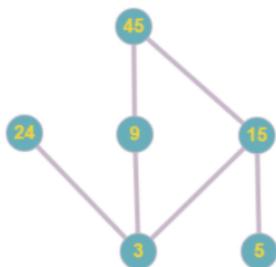
Given:

$$(\{3, 5, 9, 15, 24, 45\}, |)$$

$$S = \{3, 5, 9, 15, 24, 45\}$$

$$R = \{(a, b) | a \text{ divides } b\}$$

Let us first determine the **Hasse diagram**



The **maximal elements** are all values in the Hasse diagram that do not have any elements above it.

maximal elements = 24, 45

Q.11)

L1 data (D-L1) cache configuration of Core 2 Duo is given as below

Size 32KB, 8-way set associativity, 64B block

Assume 32-bit memory address

Which of the following is NOT correct?

A Tag is 20 bits

B Index is 6 bits

C Offset is 6 bits

D The cache has 128 sets

Subject: computer organization

Max Marks: 1

Correct Option

Solution: (D)

Explanation:

Cache Size = 32KB

Block size = 64B

Number of cache blocks/lines = 32KB/64B = 512

Given cache is a 8-way set associative

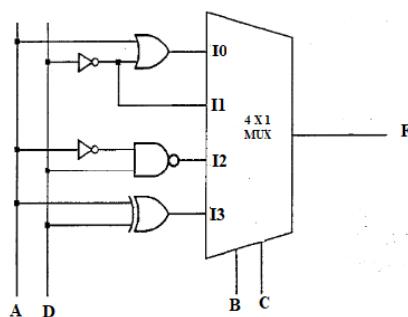
Set index = 512/8 = 64 = 6 bits for set

Number of sets are 64

Option D is incorrect as it contains 128 sets.

Q.12)

Consider the below given combinational circuit:



Subject: digital logic systems

Max Marks: 1

What will be the function of F, if B = 0 and D = 1?

A $A' + C'$

B AC'

Correct Option

Solution: (B)

Solution:

For the given MUX:

$I0 = A + D'$

$I1 = D'$

$$I_2 = (A'D)^* = A + D^*$$

$$I_3 = A \oplus D$$

Therefore, for $B = 0$, we can choose two input lines which are I_0 and I_1 . Therefore, expression for F will be:

$$\begin{aligned} F &= B'C'(I_0) + B'C(I_1) \\ &\Rightarrow I_1 C'(A + D^*) + I_0 C(D^*) \\ &\Rightarrow C'(A + 0) + C(0) \\ &\Rightarrow AC' \end{aligned}$$

Thus, option (ii) is correct.

A $AC' + A$

B None of the above

Q.13)

Which of the following is/are True

- I. If L is accepted by a nondeterministic finite automaton, then there is some deterministic PDA accepting L .
II. If L is accepted by a deterministic PDA, then L' (the complement of L) must be regular.

Subject: Theory of Computation, Compiler Design

Max Marks: 1

A I only

Correct Option

Solution: (A)

Explanation:

- I. If L is accepted by a nondeterministic finite automaton, then there is some deterministic PDA accepting L .
True, since there must also be a deterministic FSM and thus a deterministic PDA.
II. If L is accepted by a deterministic PDA, then L' (the complement of L) must be regular.
False. Consider $L = anbn$. $L' = \{w \in \{a, b\}^*: either\ some\ b\ comes\ before\ some\ a\ or\ there\ is\ an\ unequal\ number\ of\ a's\ and\ b's.\}$. Clearly this language is not regular since we can't count the a's and b's.

B II only

C Both I and II

D Neither I nor II

Q.14)

A binary tree with 27 nodes has _____ null branches.

Subject: Data Structures

Max Marks: 1

A 54

B 27

C 26

D None of these

Correct Option

Solution: (D)

Binary tree with n nodes has $n+1$ null branches. Answer is 28 null branches.

Q.15)

Which of the following is/are False

- I. $(L_1 L_2 L_3)^* = L_1^* L_2^* L_3^*$
II. $(L_1^* \cup L_2^*) = (L_1^* \cup L_2^*)^*$
III. $L_1^* (L_2 \cup L_3)^+ = (L_1^* L_2^+ \cup L_1^* L_3^+)$

Subject: Theory of Computation, Compiler Design

Max Marks: 1

A I, II and III

Correct Option

Solution: (A)

Explanation:

- I. $(L_1 L_2 L_3)^* = L_1^* L_2^* L_3^*$ False
 $L_1 \cap L_2 = \emptyset \Rightarrow L_1 \cap L_2 \cap L_3 = \emptyset$

Then $(abc)^* = \{\epsilon, abc, abcabc, \dots\}$
 $a^*b^*c^* = \{\epsilon, a,b,c, aa,bb,cc,\dots\}$

II. $(L_1^* \cup L_2^*) = (L_1^* \cup L_2^*)^*$ False

Let $L_1 = a, L_2 = b$

$(a^* \cup b^*) = \{\epsilon, a, aa, aaa, b, bb, bbb, \dots\}$

$(a^* \cup b^*)^* = (a+b)^* = \{\epsilon, a, b, aa, ab, ba, bb, \dots\}$

III. $L_1^* (L_2 \cup L_3)^+ = (L_1^* L_2^+ \cup L_1^* L_3^+)$ False

Let $L_1 = a, L_2 = b, L_3 = c$

$a^*(b \cup c)^+ = \{\epsilon, a, aa, aaa, \dots\} \{b, c, bc, cb, \dots\}$

$= \{b, c, bc, cb, ab, ac, abc, acb, \dots\}$

$(a^* b^+ \cup a^* c^+) =$

$a^* b^+ = \{\epsilon, a, aa, aaa, \dots\} \{b, bb, bbb, \dots\}$

$= \{b, bb, bbb, ab, abb, abbb, \dots\}$

$a^* c^+ = \{\epsilon, a, aa, aaa, \dots\} \{c, cc, ecc, \dots\}$

$= \{c, cc, ccc, ac, acc, accc, \dots\}$

$(a^* b^+ \cup a^* c^+) = \{b, bb, bbb, ab, abb, abbb, c, cc, ccc,$

$ac, acc, accc, \dots\}$

But the strings like abc or acb are not there.

A I and II only

B II and III only

C I and III only

Q.16)

Select which of the following is false

I. $3^n = O(2^n)$

II. $\log(3^n) = O(\log(2^n))$

III. $\log_3 n = O(\log_2 n)$

IV. $\log(n^2) = O(\log(n^3))$

Subject: Algorithms

Max Marks: 1

A I and II

B II only

C I, II and III

D None of the above

Correct Option

Solution: (D)

Solution:

I. $3^n = O(2^n)$

This statement is false as 3^n always grows faster than 2^n . No constant can be found which will make them equal.

II. $\log(3^n) = O(\log(2^n))$

$\log(3^n) = n \log 3 = O(n)$.

$O(\log(2^n)) = n \log 2 = O(n)$.

This statement is true.

III. $\log_3 n = O(\log_2 n)$

$\log_3 n = \log_2 3 * \log_2 n$

Here $\log_2 3$ is the constant therefore this statement is true.

IV. $\log(n^2) = O(\log(n^3))$

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

$\log(n^3) = 3 \log n = O(\log n)$

This statement is also true.

Therefore only statement I is false.

Q.17)

Consider the code fragment below:

1 addi \$sp, \$sp, -8

2 lw \$t0, 4(\$sp)

3 add \$t1, \$t0, \$a0

A.

Subject: computer organization

Max Marks: 1

4. 1W 3LZ, 0(5SP)

5. sub \$v0, \$t1, \$t2

Number of RAW dependencies from the given code is _____

Correct Answer

Solution: (5)

Answer: 5

Explanation:

I1 → I2 (\$sp)

I1 → I4 (\$sp)

I2 → I3 (\$t0)

I3 → I4 (\$t1)

I4 → I5 (\$t2)

Q.18)

For an application of counting semaphore S, which has an initial value of 1, the two operations, P and V were understood by the student as: P is an UP operation and V is a down operation.

Operations: 10V, 5P, 4V, 3P, 5V, 6P

The size(length) of queue, the student would get when the above P and V operations are completed on the semaphore is _____

Subject: operating systems

Max Marks: 1

Correct Answer

Solution: (4)

Explanation:

Since the student understood it wrong, the operations 10V, 5P, 4V, 3P, 5V, 6P are basically 10P, 5V, 4P, 3V, 5P, 6V operations.

	10P	5V	4P	3V	5P	6V
S.val :	0	0	0	0	0	0
Queue length :	9	4	8	5	10	4

At the end, 4 processes wait in the queue, therefore the size of the queue = 4

Q.19)

Given a bit pattern of floating point numbers in IEEE 754 single precision format.

Which of the following is the correct octal equivalent of this number?

Subject: digital logic systems

Max Marks: 1

0	1101010000...0	10000101
<-----sign----->	bit(1)-----><-----Mantissa----->	

bit(23)-----><-----Exponent bit(8)----->

A 117

B 75

C 160

D 165

Correct Option

Solution: (D)

Solution:

For the given number in single precision format, the normalised form is given by:

$(-1)^0 \times (1.M) \times 2^{E-127}$

The exponent is: $10000101 = 128 + 4 + 1 = 133$

Therefore, the format will be:

$\Rightarrow (-1)^0 \times (1.110101000...0) \times 2^{133-127}$

$\Rightarrow 1.110101000...0 \times 2^6$

=> 1110101

=> 117₁₀

We need to get the octal equivalent of this which will be: 001 110 101 => 165₈

Q.20)

Which best describes the Ethernet protocol?

Subject: Computer Networks

Max Marks: 1



A

Talk only if you hear no one else talking, but stop as soon as you hear anybody else.

Correct Option

Solution: (A)

Explanation:

Ethernet is based on CSMA/CD in which it first senses the channel. If the channel is idle then it will send. If there is a collision or someone else is transmitting it will stop the transmission immediately.

This is another LAN technology which is not used in ethernet, the station who holds the token can transmit.

This mechanism not use in ethernet.

This uses the time division method for transmitting which is not used in ethernet.

B

Pass a ticket around and only talk if you are holding the ticket.

C

Raise your hand and wait till a moderator gives you permission to talk.

D

Every person is scheduled a time to talk.

Q.21)

Which of the following is not a possible subsequence sum

S={0, 21, -30, -23, 1, 23, -20, -10, 9, -12, -11}

Subject: Algorithms

Max Marks: 1



A

-53

B

-54

C

-23

D

None of the above

Correct Option

Solution: (D)

Solution:

Sums of size 1 are the elements itself =0, 21, -30, -23, 1, 23, -20, -10, 9, -12, -11.

Sums of size 2 are sum of the consecutive elements=21, 7, -53, 24, 22, 3, 30, -1, -3, 23

All of the options are possible, so none of the above is the correct answer.

Q.22)

For the below given schedules, the actions are listed in the order they are scheduled

and prefixed with the transaction name.

S1: T1:R(B), T3:R(A), T3:W(A), T2:R(B), T2:W(A), T3:W(C), T1:R(A), T2:R(C);

S2: T2:R(B), T2:W(B), T1:W(A), T1:R(B), T3:R(A), T1:W(B), T2:W(A);

Subject: DBMS

Max Marks: 1



Which of the following options are not correct about the above given schedule?

A

Schedule S1 is conflict serializable.

B

Schedule S2 is not conflict serializable.

C

Both S1 and S2 are conflict serializable and have the same conflict equivalent serial schedule.

Correct Option

Solution: (C)

Solution:

The schedule S1 is conflict serializable while schedule S2 is not conflict serializable due to occurrence of cycle in between transaction T1 and T2. Therefore, statement (i) and (ii) are correct. Since, schedule S2 is not conflict serializable, therefore, it cannot have conflict equivalent serial schedule. Thus, the statement given in option (iii) is not correct.

Hence, the correct option is (iii)

D

Schedule S1 is not serial.

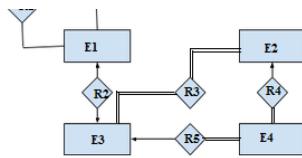
Q.23)

Consider the below given ER diagram:

Subject: DBMS

Max Marks: 1





The minimum number of relations required for the above ER-diagram are _____

Correct Answer

Solution: (4)

Solution: 4

For self referential many-to-many relationship R1 of entity E1, 2 separate relations are required. Therefore, number of relations = 2

For one-to-one both side partial relationship R2, both entity E1 and E3 will have separate relation, thus the number of relation = 3

Entity E2 could be merged with entity E3 due to many-to-many relationships with both side total participation. Therefore, number of relations = 3

Entity E4 will have a separate relation due to one-to-many relationship with both entity E3 and E2. Thus, the total number of relations will be 4.

Q.24)

Which of the following languages is/are False :

- $L = \{a^{2n}b^{2p}c^n d^p \mid n, p \geq 0\}$ is CFL
- $L = \{ww'w \mid w \in \Sigma^*\}, \Sigma = \{a, b\}$ is CFL
- $L = \{a^n b^n \mid n \geq 0\}$ then L^k is context free.

A

I,II and III

B

I and II only

Correct Option

Solution: (B)

Explanation:

$L = \{a^{2n}b^{2p}c^n d^p \mid n, p \geq 0\}$ is CFL FALSE

Given language is Non-CFL, as it requires more than one stack to check the equality between $a^{2n}c^n b^{2p}d^p$

$L = \{ww'w \mid w \in \Sigma^*\}, \Sigma = \{a, b\}$ is CFL

Given language is Non-CFL, as it requires more than one stack to check the equality between ww' and ww .

$L = \{a^n b^n \mid n \geq 0\}$ then L^k is context free. True

$L = \{a^n b^n \mid n \geq 0\}$ is CFL and $L^k = L \cdot L \dots L$ (upto k times).

As the given language is CFL and from the closure properties CFLs are closed under Concatenation operation.

C

I and III only

D

II and III Only

Q.25)

Consider a memory hierarchy with the following information:

Subject: computer organization

Max Marks: 2

Hierarchy = primary cache, secondary cache, main memory

tc1 = Access time to primary cache = 5 ns

tc2 = Access time to secondary cache = 20 ns

tc3 = Access time to main memory = 70 ns

h1 = hit ratio to primary cache = 0.95

h2 = hit ratio to secondary cache = 0.95

h3 = hit ratio to main memory = 1

What is the average access time for this memory hierarchy?

Correct Answer

Solution: (7.35)

Answer: 7.35

Explanation:

$$\begin{aligned}
 T_{ave} &= h1t1 + (1-h1)(h2)(t2 + t1) + (1-h1)(1-h2)h3(t3 + t2 + t1) \\
 &= 0.95 \cdot 5 + 0.1 \cdot (0.95) \cdot (5+20) + 0.1 \cdot (0.05) \cdot 1 \cdot (5+20+70) \\
 &= 4.5 + 2.375 + 0.475 = 7.35
 \end{aligned}$$

Q.26)

Subject: Theory of Computation, Compiler Design

Max Marks: 2



Consider the following grammar

$G = \{bexpr, \{bexpr, bterm, bfactor\}, \{\text{not, or, and, (,)}, \text{true, false}\}, P\}$

with P given below.

$bexpr \rightarrow bterm E'$

$E' \rightarrow \text{or } bterm E' \mid \epsilon$

$T' \rightarrow \text{and } bfactor T' \mid \epsilon$

$bterm \rightarrow bfactor T'$

$bfactor \rightarrow \text{not } bfactor \mid (bexpr) \mid \text{true} \mid \text{false}$

Follow(bfactor) is

A {and,or}

B {and, or,)}

C {and,or,), \$}

Correct Option

Solution: (c)

Explanation:

$\text{First}(bexpr) = \text{First}(bterm) = \text{First}(bfactor) = \{\text{not, (, true, false}\}$

$\text{First}(E') = \{\text{or, } \epsilon\}$

$\text{First}(T') = \{\text{and, } \epsilon\}$

$\text{Follow}(bexpr) = \{\$,)\}$

$\text{Follow}(E') = \text{Follow}(bexpr) = \{\$,)\}$

$\text{Follow}(bterm) = \text{First}(E') \cup \text{Follow}(E') = \{\text{or,), \$}\}$

$\text{Follow}(T') = \text{Follow}(bterm) = \{\text{or,), \$}\}$

$\text{Follow}(bfactor) = \text{First}(T') \cup \text{Follow}(T') = \{\text{and, or,), \$}\}$

D {and,or, \$}

Q.27)

Subject: Engineering Mathematics

Max Marks: 2



A determinant is chosen at random from the set of all determinants of order 2 with elements 0 or 1 only, the probability that the determinant chosen is non-zero is

A 3/8

Correct Option

Solution: (A)

Solution:

For a 2×2 matrix the total number of distinct matrices possible = 2^4 .

For determinant to be nonzero if $a*d=1$ and $b*c=0$ or $a*d=0$ and $b*c=1$.

$ad=1 \Rightarrow$ both a and $d=1$ and $bc=0$ b or $c=0$ therefore there are 3 ways in which it is possible, similarly for $ad=0$ and $bc=1$ there are 3 ways possible.

Required probability = $6/16 = 3/8$.

B 3/16

C 1/8

D 1/16

Q.28)

Subject: Algorithms

Max Marks: 2



A priority Queue is implemented in the following way such that it is both a min-heap and a binary search tree (assume $n \geq 2$ elements).

Statement I: An element in it can be searched in $O(\log n)$ time in the worst case.

Statement II: An element deleted from it can be deleted in $O(\log n)$ time in the worst case.

Analyse the implementation and choose which of the following statements are true.

A It is possible that statement I to be true but not possible that statement II is true.

B It is possible that statement II to be true but not possible that statement I is true.

C It is possible that both statement I and statement II are true together.

D It is not possible to have both the statements true together.

Correct Option

Solution: (D)

Solution:

In case of a min-heap the least node is for any subtree is its root, in a BST the values smaller than that of the root are stored on the left of the subtree, if we look at such a BST then all the left pointers are NULL and this will become a skewed tree which is skewed towards the right. The height of the tree is O(n) and time taken to search and delete in the worst case would be O(n). Therefore it is not possible to have such a tree for n>2.

Q.29

Consider the following instance of the relation EVENT:

Subject: DBMS

Max Marks: 2



a-ipaddr	v-ipaddr	Date
9.9.9.1	10.10.10.2	2-1-2012
9.9.9.2	10.10.10.1	2-2-2012
9.9.9.2	10.10.10.3	2-2-2012
9.9.9.9	10.10.10.4	2-3-2012
9.9.9.9	10.10.10.3	2-4-2012
9.9.9.10	10.10.10.3	2-5-2012
9.9.9.10	10.10.10.4	2-6-2012

Also, consider the query ran over the given instance of EVENT:

$\pi_{a\text{-ipaddr},v\text{-ipaddr}}(\text{EVENT}) \div \pi_{v\text{-ipaddr}}[\sigma_{a\text{-ipaddr}=9.9.9.9}(\text{EVENT})]$

The number of rows present in the resultant set on running the above query are _____

Correct Answer

Solution: (2)

Solution: 2

The above query returns all the attackers that attacked all the victims attacked by the attacker 9.9.9.9

The second part of the query will return all the v-ipaddr whose a-ipaddr is 9.9.9.9, thus it will return 10.10.10.3 and 10.10.10.4. Now, on division with these two values of v-ipaddr, the result will be 9.9.9.9 and 9.9.9.10. Thus the resulting set will have 2.

Q.30

Consider the following sequence of instructions:

Subject: computer organization

Max Marks: 2



1. sub \$4,\$3,\$1

2. add \$5,\$4,\$2

3. st \$5,100(\$4)

4. lw \$6,200(\$5)

5. sub \$6,\$6,\$5

The number of stall cycles during the execution of these instructions on the regular 5 stage pipelined processor is _____. (Assume that the pipeline stages are IF, ID, EX, MEM, WB and each pipeline stage takes the uniform cycles and no forwarding is used.)

Correct Answer

Solution: (14)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I1	F	D	E	M	W										
I2		F	D	-	-	E	M	W							
I3			F	-	-	D	-	-	E	M	W				
I4				-	-	F	-	-	D	E	M	W			
I5							-	-	F	D	-	-	E	M	W

I4 Fetch is waiting for the I3 decode stalls for 2 cycles and similarly I5 also stalls for 2 cycles for I4.

Total number of stall cycles are 14

Q.31)

Subject: DBMS

Max Marks: 2

Consider a relation company with 3000 records are of fixed length, with record size 50 bytes are stored in blocks of size 512 bytes (unspanned). If a secondary index is built on the key field of size 10 bytes and a block pointer of size 5 bytes, the number of first level index blocks are _____

Correct Answer

Solution: (89)

Solution: 89

Since, Index block factor = $512/(10 + 5) = 34$ The index built is secondary; therefore, there will be an index entry for each record. So, at first level index blocks will be = $\text{ceil}(3000/34) = 88.23 = 89$

Q.32)

Subject: operating systems

Max Marks: 2

We are given a disk, where the sector size is 512 Bytes, the number of sectors per track is 64, the controller overhead time is 5.5 ms, the transfer rate is 3.5 MB/second, rotation rate is 3600 RPM and the average seek time is 12 ms. The approximated average time to read one sector of the disk is :

A 26 ms

Correct Option

Solution: (A)

Explanation :

$$\begin{aligned} \text{Disk Access Time} &= \text{seek time} + \text{rotational delay} + \text{transfer time} + \text{controller overhead} \\ &= 12 + (0.5 * 60 * 10^3 / 3600) + (512 / (3.5 * 2^{20})) * 1000 + 5.5 \\ &= 25.97 \text{ ms} = 26 \text{ ms} \end{aligned}$$

B 46 ms

C 9 ms

D 61 ms

Q.33)

Subject: Algorithms

Max Marks: 2

There are n hostel rooms, each of which requires a secure internet connection. It costs w_i rupees to install a secure router in hostel room i and it costs c_{ij} rupees build a secure fibre connection in between rooms i and j . A hostel room receives a secure internet connection if either there is a router installed in the room or there is some path of a fibre connection in between the room with a fibre connection or a router. What is the cost to provide an internet connection to all of the rooms indicated by the below graph, each node represents a room and within the node the cost to have a router is given and each edge represents the cost of having a fibre connection in between the two rooms (Assume that only one room can have a router installed).

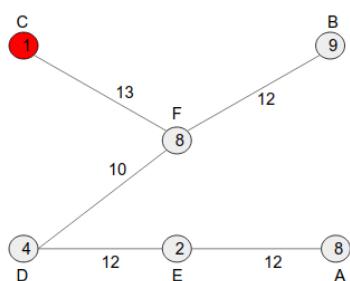
A 59

B 60

Correct Option

Solution: (B)

Solution:



Here we need to set up the router for one of the room and have a connection to all of the other rooms from this room the best way is to choose the room with the cheapest router setup cost and then look for the minimal spanning tree. Selecting room C as the source room we will be able to have the MST as shown in the figure, the cost is as follows

Cost=Cost of router+cost of MST

=1+(10+12+12+12)=59

$$= -1 + (10 + 12 + 12 + 12 + 13) \\ = 60.$$

58

None of the above

Q.34)

Consider the following description about processes in a system:

Process ID	AT	BT	CT(FCFS)	CT(SJF)
P0	0	4	4	4
P1	0	X	A	14
P2	0	Y	14	B
P3	0	6	20	20

For FCFS, in case of a tie, processes with lower ids will be scheduled first.

For SJF, the processes that get scheduled 1st and last are the processes with least and highest process ids respectively.

Also X - Y = 2. Therefore the value of B is _____

Subject: operating systems

Max Marks: 2



Correct Answer

Solution: (8)

Answer: 8

Explanation:

Consider the Gantt chart for FCFS and SJF below:

FCFS

P0	P1	P2	P3
0	4	A	14

We know, X - Y = 2, means X > Y. Therefore, P2 has lower burst than P1.

SJF

P0	P2	P1	P3
0	4	B	14

From the Gantt chart we can see that X + Y = 14 - 4 = 10 units --- Eq 1

We know X - Y = 2 --- Eq 2

Solving Eq 1 and 2, we get, X = 6, Y = 4

From Gantt chart, we know,

$$A = 4 + X = 4 + 6 = 10$$

$$B = 4 + Y = 4 + 4 = 8$$

Q.35)

The area bounded by the curve $x^2 = 4y$ and $x = 4y - 2$ is

Subject: Engineering-Mathematics

Max Marks: 2



9/8

Correct Option

Solution: (A)

Solution:

The given curves are $x^2 = 4y$ and $x = 4y - 2$

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$(x-2)(x+1) = 0$$

$x = 2, -1$ these are two points are the points of intersection for these curves.

As the line $x = 4y - 2$ is above the curve $x^2 = 4y$ in the interval from $x = -1$ to 2

$y = 1, \frac{1}{4}$ respectively.

Now the area covered by them is

$$\begin{aligned} &= \int_{-1}^2 \left(\frac{x+2}{4} - \frac{x^2}{4} \right) dx \\ &= \left[\frac{x^2}{2} + 2x - \frac{x^3}{3} \right]_{-1}^2 \\ &= 9/8 \text{ Square Units.} \end{aligned}$$

B 8/3

C 1/2

D 4/3

Q.36)

Given below are two statements S1 and S2.

Subject: Discrete Mathematics

Max Marks: 2

S1 : Any proper subgroup of any group of order 185 is abelian.

S2 : If R is an equivalence relation on a finite non-empty set A, then the equivalence classes of R all have the same number of elements.

Which of the below options is correct about the statements mentioned above?

A Only S1 is true.

Correct Option

Solution: (A)

Solution:

S1:

$$185 = 37 \cdot 5$$

By Lagrange Theorem, any non-trivial proper subgroup of a group of order 185 must have an order that divides 185, i.e. 5 or 37. In both cases, this subgroup must be cyclic (since any group of a prime order is cyclic), hence it must be abelian (since any cyclic group is abelian).

S2 :

This is false. For example, if $A = \{1, 2, 3\}$ and $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3)\}$ then $[1] = \{1, 2\}$ has more elements than $[3] = \{3\}$.

B Only S2 is true.

C Both S1 and S2 are true.

D Both S1 and S2 are false

Q.37)

Consider the following statements

Subject: Data Structures

Max Marks: 2

I. Consider the heap structure containing N nodes is always guaranteed to have the minimum possible height.

II. Suppose that T is a full binary tree. It is possible that the total number of nodes in T is even

Which of the following statements are TRUE?

A Only I

Correct Option

Solution: (A)

Solution: Only I

Yes. In a complete tree, all the levels except (possibly) the bottom one are full. Since that leaves no "gaps" in the upper levels to which leaves could be moved, it would be impossible to make the tree shorter by moving nodes up.

No, A full binary tree with I internal nodes has $I + 1$ leaf nodes. Then the total must be $2I + 1$, which is odd

B Only II

C Both I and II

D None of these

Q.38)

If the solution for the system of equations given below is (x,y,z)

Subject: Engineering-Mathematics

Max Marks: 2

$$4x + 2y + z = 21$$

A connected graph G is a tree if and only if every edge of G is a cut-edge, it means that $G - e$ is disconnected for every $e \in E(G)$.

(\Rightarrow) Let G be a tree with $e \in E(G)$, $e = xy$.
 Since G is a tree there is a unique xy -path (e), so $G - e$ is not connected.
 (\Leftarrow) Let G be a connected graph such that every edge is a cut edge.
 Consider two vertices $u, v \in V(G)$, since G is connected there must be at least one uv -path P .
 If there was another uv -path Q no edge of P would be a cut edge.
 Which contradicts the assumption that every edge is a cut edge.

S2 :

Since G is connected, there is a uv -path between any pair of vertices.
 Note that this question should have read:
 Show that if a graph G has an odd degree vertex, then there are two vertices u and v both of odd degree which have a uv -path between them.

D

Both S2 and S2 are false

Q.41)

Subject: Computer Networks

Max Marks: 2



Consider sending a file $F = M * X$ bits from A to D over the network below, consisting of four nodes and three links.



Assume the network is a packet-switched network and the file is split into M packets each of size X . Each packet is then given an additional H bits of header and each packet is transmitting continuously like a pipelining. Each link transmits at R bps. Assume that propagation delay on the links is negligible. How much time does it take from when the first bit of the file leaves A to when the last bit arrives at D?

A

$3 MX/R$

B

$3M(X+H)/R$

C

$M(X+H)/R$

D

$(M+2)(X+H)/R$

Correct Option

Solution: (D)

Explanation:

The transfer time of one packet = $(X+H)/R$

In the pipelining mechanism, all packets will take CPT= 1 and the last packet will take K cycles.

Here we have three stages = $K=3$

$n=M$ we have M packets

$$\text{Total time} = (K + n - 1) \text{Transfer time}$$

$$= (3 + M - 1) T_t$$

$$= (M+2)(X+H)/R$$

Q.42)

Subject: Algorithms

Max Marks: 2



The optimal cost to multiply the chain of matrices with the following dimensions is _____. (Here cost refers to the number of multiplication operations).

A 2x3

B 3x4

C 4x2

D 2x4

Correct Answer

Solution: (52)

Solution: 52

Cost of multiplying is calculated using the dynamic programming algorithm

$AB=2*3*4=24$
 $BC=3*4*2=24$
 $CD=4*2*4=32$

$ABC = \text{Min}((AB)C, A(BC))$
 $= \text{Min}(24+2*4*2, 24+2*3*2) = 36.$

$BCD = \text{Min}((BC)D, B(CD))$
 $= \text{Min}(24+3*2*4, 32+3*4*4) = 48.$

$ABCD = \text{Min}((A(BCD), (AB)(CD), (ABC)D)$
 $= \text{Min}(2*3*3+48, 24+32+2*4*4, 36+2*2*4) = 52$

Q.43)

Which of the following is true about the given context free grammar
 $G = (\{S, A, B\}, S, \{a, b, x\}, P)$ with P :

- $S \rightarrow A$
- $S \rightarrow xb$
- $A \rightarrow aAb$
- $A \rightarrow B$
- $B \rightarrow x$

A The given grammar is not LR(0) as it contains RR conflict

B The given grammar is both LR(0) and SLR(1)

C The given grammar is not LR(0) but SLR(1)

D The given grammar is not SLR(1) but CLR(1)

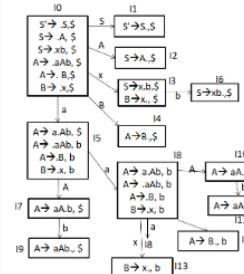
Subject: Theory of Computation, Compiler Design

Max Marks: 2



Solution: (D)

Explanation:



The given grammar is not LR(0) and not SLR(1)

State I3 contains S/R conflict in LR(0) and SLR(1)

$\{b\}$ intersection Follow(B) = $\{b\}$ which is not equal to Φ
The given grammar is not SLR(1).

Correct Option

Q.44)

Which of the following options is the correct matching of the fields in header to their availability in IPv4 and IPv6.

- | | |
|-------------------------|--------------------------|
| 1. source address | (i) IPv4 but not IPv6 |
| 2. flow label | (ii) IPv6 but not IPv4 |
| 3. fragmentation fields | (iii) IPv4 and IPv6 |
| 4. source port. | (iv) Not in IPv4 or IPv6 |

A 1-(iii), 2-(ii), 3-(iii), 4-(iv)

B 1-(i), 2-(ii), 3-(iii), 4-(iv)

C 1-(iii), 2-(ii), 3-(i), 4-(iv)

Subject: Computer Networks

Max Marks: 2



Solution: (C)

Explanation:

source address: Available in IPv4 and IPv6

flow label:	Available in IPv6 but not in IPv4
fragmentation fields:	Available in IPv4 but not in IPv6
source port: header	Not available in IPv4 or IPv6, It is a part of TCP

D 1-(ii) , 2-(i), 3- (iv), 4-(iii)

Q.45)

Consider the following schedule on database object A, B, C, and D:

Subject: DBMS

Max Marks: 2

Time	T1	T2	T3
1			
2			R(C)
3			
4			
5			
6	R(A)		
7			
8			
9			
10			W(C)
11		R(A)	
12		W(A)	
13			
14			
15			
16	W(B)		
17			
18			
19			
20	R(D)		
21			
22			
23		Commit	
24			
25			
26			
27	Commit		
28			
29			
30			
31			W(B)
32			
33			Commit

Consider the below given statements:

- I. The above schedule is permitted by 2PL.
 - II. The transaction T1 can lock the objects A, B and D at time 5. Then, T1 releases locks A, B and D at 7, 17 and 21 respectively. While transaction T3 locks the item C and B at times 1 and 30 respectively and releases all locks at time 32.
- Which of the above statements are true about the given schedule?

A Only I

B Only II

C Both I and II

Correct Option

Solution: (c)

Solution:

- I. The given schedule is allowed under basic 2 phase locking protocol.
- II. The given timestamps for locking and unlocking the data items are allowed as no conflict will be created by them.
Thus, both the statements are correct. Hence, the correct option is (iii).

D Neither I nor II

Q.46)

Consider the given K-map:

Subject: digital logic systems

Max Marks: 2

AB\CD	00	01	11	10
00	0	0	1	1
01	0	1	0	0
11	0	1	0	1
10	1	0	0	1

The number of essential prime implicants and redundant prime implicants are?

- A 1, 4
- B 4, 0
- C 0, 4
- D 4, 1

Correct Option

Solution: (D)

Solution:

AB\CD	00	01	11	10
00	0	0	EPI 1	1
01	0	1	EPI 1	0
11	0	1	0	EPI 1
10	1	EPI 0	0	Red 1

There are a total 5 prime implicants, out of which 4 are essential prime implicants and 1 is redundant prime implicant. Therefore, the correct option is (iv).

Q.47)

Subject: operating systems

Max Marks: 2

If we have to design a virtual memory system where the page table entry size is 4 Bytes, the system must be able to support virtual address space as large as 2^{38} bytes and each page table must fit in a single frame.

If multi-level paging scheme has to be used with no more than 2 levels of page tables, the minimum page size that our system must have is:

- A 2^{16} B
- B 2^{20} B
- C 2^{18} B
- D 2^{14} B

Correct Option

Solution: (D)

Explanation :

Let 2^p be the page (and frame) size. The maximum number of page table entries that can fit in a single frame is 2^{p-2} , since page table entries are 4 bytes. For two level paging, each virtual address is composed of two page numbers (each one $p-2$ bits long) and a p -bit offset. For a 2^{38} byte address space we need:

$$(p-2) + (p-2) + p = 38$$

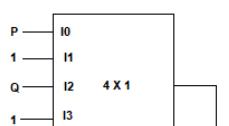
so $p = 14$. The minimum page size is 2^{14} bytes.

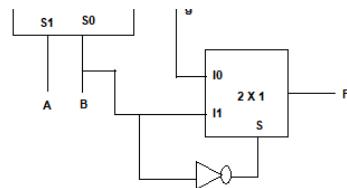
Q.48)

Subject: digital logic systems

Max Marks: 2

Which of the following values of P and Q are correct for the function $F(A, B, C) = \Sigma(2, 3, 6, 7)$ given below?





A $P = Q = C$

B $P = C, Q = 1$

C $P = 0, Q = C$

D All of the above

Correct Option

Solution: (D)

Solution: For the given function $F(A, B, C) = \Sigma(2, 3, 6, 7)$, the expression will be:

$$\Rightarrow A'B'C' + A'BC + ABC' + ABC \text{ -----> Equation 1}$$

Based on the combinational circuit given, the expression for g will be:

$$\Rightarrow S_1'S_0' \cdot I_0 + S_1'S_0 \cdot I_1 + S_1S_0' \cdot I_2 + S_1S_0 \cdot I_3$$

$$\Rightarrow A'B'P + A'B + AB'Q + AB$$

Since, g is the input at I0, so expression for function F in terms of g, P and Q is:

$$\Rightarrow S'I_0 + S.I_1$$

$$\Rightarrow B \cdot (A'B'P + A'B + AB'Q + AB) + B'B$$

$$\Rightarrow A'B'P \cdot B + A'B \cdot B + AB'Q \cdot B + AB \cdot B$$

$$\Rightarrow A'B + AB$$

On expanding it we will get:

$$\Rightarrow A'B'C + A'BC' + ABC + ABC' \text{ -----> Equation 2}$$

Since both equation 1 and 2 are the same, therefore, we can say that P and Q can take any value as their value doesn't affect the final expression. Hence, the most suitable option is (iv)

Q.49)

Minimum number of states in a DFA that accepts the language

$L = \{w | w \text{ has an even number of a's and one or two b's}\}$

Subject: Theory of Computation, Compiler Design

Max Marks: 2

A 6

B 7

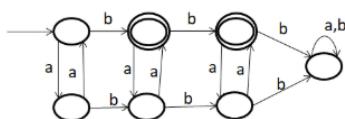
Correct Option

Solution: (B)

Explanation:

The set of strings from the language is $= \{b, aab, bb, aaaabb, aba, baa, \dots\}$

The DFA that accepts the given language contains 7 states.



C 8

D 9

Q.50)

Consider the following statements

I. Finding the minimum value in Binary Search Tree takes $O(\log N)$ time with N elements in the list.

II. Finding a Maximum value in Binary Min Heap takes $O(N)$ time with the size of N elements in the list.

Which of the following is True?

Subject: Data Structures

Max Marks: 2

A Only I

B Only II

Correct Option

Solution: (B)

I. To find the minimum value we have to traverse to the left until we hit NULL pointer. Here in the worst case the given BST can be left skewed. Therefore it requires $O(N)$.

To find the minimum value we have to traverse to the last half the number of nodes in the worst case and the given set can be ordered well therefore it requires $O(1)$

II. The Max value can be found in one of the last $N/2$ values. Therefore it requires $O(N)$.

C Both I and II

D None of these

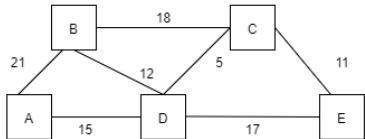
Q.51)

Subject: Computer Networks

Max Marks: 2



We have 5 nodes A, B, C, D, E to run a distance-vector protocol for routing between these nodes. They are currently configured as the picture below, with respective edge costs.



What will be the routing table of node E after one iteration of the algorithm?

A

Destination	Cost	Next hop
A	∞	-
B	∞	-
C	11	C
D	17	D
E	0	E

B

Destination	Cost	Next hop
A	32	D
B	29	D
C	11	C
D	16	C
E	0	E

Correct Option

Solution: (B)

Explanation:

The initial routing table of E is :

It only know the details of his own neighbour

Destination	Cost	Next hop
A	∞	-
B	∞	-
C	11	C
D	17	D
E	0	E

After one iteration the nodes C and D shares its distance vector to E

Distance vector of C is : $\infty, 18, 0, 5, 11$

Distance vector of D is : $15, 12, 5, 0, 17$

The new routing table of E after one iteration

Destination A= via D ($17 + 15 = 32$)

Destination B = min [via D($17+12$), via C($11, 18$)] = 29 via D[take any of them both are same]

Destination C= via C = 11

Destination D= via D= 17

Destination E = via E = 0

Destination	Cost	Next hop
A	32	D
B	29	D
C	11	C
D	16	C
E	0	E

c

Destination	Cost	Next hop
A	32	D
B	29	C
C	16	C
D	11	C
E	0	E

d

Destination	Cost	Next hop
A	50	B
B	29	C
C	11	C
D	17	D
E	0	E

Q.52)

Subject: Discrete Mathematics

Max Marks: 2



Given the following statements S1 and S2:

S1 :

If $f : \mathbb{N} \rightarrow \mathbb{N}$ is an increasing function, then f is one-to-one.

S2 :

If $f : A \rightarrow B$ and $g : B \rightarrow C$ are functions, then $f \circ g : A \rightarrow C$ is defined by $(f \circ g)(x) = f(g(x))$.

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

A

Only S1

B

Only S2

C

Both S1 and S2

Correct Option

Solution: (c)

Answer:

S1:

Saying that a function is increasing merely requires that the outputs not get smaller as the input is made larger. so $f(x) = 3$ is an increasing function. To force the function to be one-to-one, it needs to be strictly increasing.

S2:

Taking $f(g(x))$ only works if the codomain of g is the same set as (or at least a subset of) the domain of f . But the way we've set up f and g , the codomain of g is C but the domain of f is A . To fix this, either we'd have to compose f and g in the other order or change how we set up their domains and codomains.

D None of them are incorrect

Q.53)

The number of characters printed on the console by running the below code
(Excluding the new line character)

```
int main(){
    int i;
    for(i = 0; i < 3; i = i + 1)
        printf("a");
        printf("b");
    printf("c");
    Return 0;
}
```

A 4

B 5

Correct Option

Solution: (B)

Solution:

The indentation of the statement `printf("b");` is misleading. It looks like it's part of the body of the for statement, but the body of the for statement is always a single statement, or a list of statements enclosed in braces {}. In this case, the body of the loop is the call `printf("a");`

The two statements `printf("b\n");` and `printf("c\n");` are normal statements following the loop.

Output of the given code is aaabc

C 6

D 7

Q.54)

Subject: C Programming

Max Marks: 2

```
#include<stdio.h>
int main(int argc, char ** argv)
{
    char **items;
    int j = 3, i;
    items = argv;
    for(i = 1; (i%4); i++)
    {
        int **p = &items[j];
        printf("%c", **p);
        j--;
    }
    return 0;
}
```

The above code is run with three command line parameters mentioned here: Paper Ink Pen
What will be the output of the above program?

A PIP

Correct Option

Solution: (A)

B Pap

C Pen

D Ink

Q.1)

Identify the odd word from the given set:
Couple, Sever, Lacerate, Rend

Subject: General Aptitude

Max Marks: 1

D Sever

B Rend

C Lacerate

D Couple

Correct Option

Solution: (D)

Solution: Sever, rend and lacerate mean to separate by force while couple means a pair. Hence, it is the odd one out.

Q.2)

Indifference to pleasure or pain

Identify the word/phrase that relates most closely to given meaning

A Perseverance

B Tolerance

C Stoicism

Correct Option

Solution: (C)

Solution: Stoicism means fortitude i.e. the ability of a person to endure pain or sorrow without expressing it which in turn means indifference towards pain.

D Reticence

Q.3)

Identify the odd word from the given set:

Taciturn, Reserved, Clamorous, Silent

A Taciturn

B Reserved

C Clamorous

Correct Option

Solution: (C)

Solution: Taciturn, reserved and silent means being reserved in speech while clamorous means vigorous in demands and complaints. Hence, it is the odd one out

D Silent

Q.4)

A cylinder, a hemisphere and a cone stand on the same base and have the same heights. The ratio of the areas of their curved surface is:

A $2 : 2 : 1$

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

Correct Option

Solution: (B)

Solution: Let the three solids have the base radius of r units.

Height of hemisphere = r = height of cylinder = height of cone. The curved surface areas of the three solids are: The curved surface area of the cylinder = $2\pi r * r = 2\pi r^2$

The curved surface area of the hemisphere = $2\pi r^2$

The curved surface area of the cone = $\pi r \sqrt{r^2 + r^2} = \sqrt{2}\pi r^2$

So the required ratio = $2\pi r^2 : 2\pi r^2 : \sqrt{2}\pi r^2 = \sqrt{2} : \sqrt{2} : 1$

C $2 : \sqrt{2} : 1$

D None of these

Q.5)

Select an appropriate synonym for Cautious.

A taught

B expert

Subject: General Aptitude

Max Marks: 1

c Cagey

Correct Option

Solution: (c)

Solution: Cautious means cagey or wary

d morally wrong

Q.6)

Subject: General Aptitude

Max Marks: 2



There are 2 classes having 20 and 25 students respectively having average marks in an examination as 20 and 25 respectively. If the two classes are represented by A and B then we have the following information:

A => Highest Score 22, Lowest Score 18

B => Highest Score 31, Lowest Score 23

If 5 people are transferred from A to B and another independent set of 5 people are transferred back from B to A, then after this operation (Assume that the set transferred from B to A contains none from the set of students that came to B from A)

What can be said about A's and B's average?

a B's average increase if A's average decreases and A's average will decrease.

b B's average will decrease always and A's average will always increase if B's average changes.

Correct Option

Solution: (b)

Solution: B's average will always decrease since the net value transferred from B to A will be higher than the net value transferred from A to B

Since the lowest score in Class B is 23 which is more than the highest score of any student in Class A. Hence, A's average will always increase.

So option (b) is correct.

c Cannot be said.

d B's average decrease if A's average decreases and A's average will increase only if B's average decreases.

Q.7)

Subject: General Aptitude

Max Marks: 2



If $a : b = c : d$, and $e : f = g : h$, then $(ae + bf) : (ae - bf) = ?$

a $\frac{(e+f)}{(e-f)}$

b $\frac{(cg-dh)}{(cg-dh)}$

Correct Option

Solution: (b)

Solution: Solve by taking values of a, b, c, d and e, f, g , and h independently of each other

$a = 1, b = 2, c = 3, d = 6$

and $e = 3, f = 9, g = 4$

and $h = 12$

gives

$$(ae + bf) : (ae - bf) = (1 * 3 + 2 * 9) : (1 * 3 - 2 * 9) = (21 : -15) = \frac{-7}{5}$$

Now by solving the options we find option (b) as the correct answer.

$$\frac{(cg-dh)}{(cg-dh)} = \frac{(3*4-6*12)}{(3*4-6*12)} = \frac{84}{-60} = \frac{-7}{5}$$

This would be the answer, since no other option gives us the same value.

c $\frac{(ce+df)}{(ce-df)}$

d $\frac{(e-f)}{(e+f)}$

Q.8)

Subject: General Aptitude

Max Marks: 2



$\frac{32^{32^{32}}}{9}$ will leave a remainder

a 4

Correct Option

Solution: (A)

Solution: $32^{32^{32}} + \alpha \rightarrow 5^{32^{32}} + \alpha = 5^{6n+x} + \alpha$

Solution: $32^{32} = 2^{9 \cdot 32 + 4}$

We write this in the form of 5^{6n+x} because 5^6 leaves a remainder of 1 when divided by 9. When we try to see 32^{32} as $6n+x$, we can find the value of x as the remainder of 2^{32} when divided by 6. The following thought process would help us find the value:

$2^{32} \div 6 = 2^{31} + 3 \rightarrow \text{Remainder} = 2$ (by the $a^n + (a+1)$ rule). Thus, $2^{32} \div 6$ would have a remainder of $2 * 2 = 4$. Hence, the required remainder would be $5^4 \div 9$, which is 4.

B

7

C

1

D

2

Q.9)

Subject: General Aptitude

Max Marks: 2

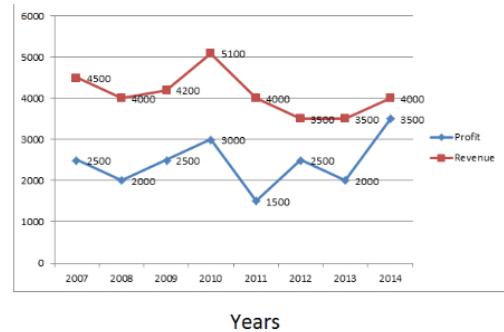


Assuming that there is no fixed component and all the units produced are sold in the same year.



Years

(Value in Rs.)



Years

In which of the following years is per unit cost the maximum?

A

2010

B

2011

Correct Option

Solution: (B)

Solution: Suppose x units are produced in each year

In year 2007:

$$25x = 4500$$

$$\text{or, } x = 180$$

$$\therefore \text{profit} = ₹ 2500$$

$$\therefore \text{CP} = ₹ (4500 - 2500) = ₹ 2000$$

$$\therefore \text{Cost per unit} = \frac{2000}{180} = ₹ 11.11$$

In year 2008:

$$20x = 4000$$

$$\text{or, } x = 200$$

$$\therefore \text{profit} = ₹ 2000$$

$$\therefore \text{CP} = ₹ (4000 - 2000) = ₹ 2000$$

$$\therefore \text{Cost per unit} = \frac{2000}{200} = ₹ 10$$

In year 2009:

$$30x = 4200$$

$$\text{or, } x = 140$$

$\therefore \text{profit} = ₹ 2500$
 $\therefore \text{CP} = ₹ (4200 - 2500) = 1700$
 $\therefore \text{Cost per unit} = \frac{1700}{140} = ₹ 12.14$

In year 2010:

$30x = 5100$
 or, $x = 170$
 $\therefore \text{profit} = ₹ 3000$
 $\therefore \text{CP} = ₹ (5100 - 3000) = ₹ 2100$
 $\therefore \text{Cost per unit} = \frac{2100}{170} = ₹ 12.35$

In year 2011:

$25x = 4000$
 or, $x = 160$
 $\therefore \text{Profit} = ₹ 1500$
 $\therefore \text{CP} = ₹ (4000 - 1500) = 2500$
 $\therefore \text{Cost per unit} = \frac{2500}{160} = ₹ 15.625$

In year 2012:

$35x = 3500$
 or, $x = 100$
 $\therefore \text{profit} = 2500$
 $\therefore \text{CP} = ₹ (3500 - 2500) = ₹ 1000$
 $\therefore \text{Cost per unit} = \frac{1000}{100} = ₹ 10$

In year 2013:

$25x = 3500$
 or, $x = 140$
 $\therefore \text{profit} = 2000$
 $\therefore \text{CP} = ₹ (3500 - 2000) = ₹ 1500$
 $\therefore \text{Cost per unit} = \frac{1500}{140} = ₹ 10.71$

In year 2014:

$20x = 4000$
 or, $x = 200$
 $\therefore \text{profit} = ₹ 3500$
 $\therefore \text{CP} = ₹ (4000 - 3500) = ₹ 500$
 $\therefore \text{Cost per unit} = \frac{500}{200} = ₹ 2.5$

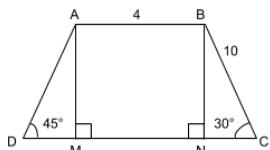
Hence, in 2011 cost price per unit is the maximum.

c 2009

d 2012

Q.10)

Find the area of the trapezium ABCD.



A $\frac{5}{2}(13 + 2\sqrt{3})$

B $\frac{5\sqrt{3}(13+5\sqrt{3})}{2}$

C $13(13 + 2\sqrt{3})$

D None of these

Subject: General Aptitude

Max Marks: 2



Solution: (D)

Solution: AB and DC are the parallel sides

$$\text{Height} = AM = BN$$

$$AB = MN = 4$$

$\triangle BNC$ and $\triangle AMD$ are right angled triangles

Correct Option

In $\triangle BNC \Rightarrow \sin 30 = \frac{BN}{10} \Rightarrow BN = 5$

Using Pythagoras theorem $NC = \sqrt{10^2 - 5^2} = 5\sqrt{3}$

In $\triangle ADM$; $AM = 5$; $\tan 45 = \frac{AM}{DM} = 1 = \frac{5}{DM}$

$\Rightarrow DM = 5$

Area of trapezium $\Rightarrow \frac{1}{2}(\text{Sum of Parallel sides}) \times \text{height}$

$$\Rightarrow \frac{1}{2}(4 + 4 + 5\sqrt{3} + 5) * 5 = \frac{5(13+5\sqrt{3})}{2}$$

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