

OVERALL ANALYSIS

Solution Report
[All](#) [Correct Answers](#) [Wrong Answers](#) [Not Attempted Questions](#)
Q.1)

Consider the following program:

```
void main()
{
    int x = 0;
    if (fork() == 0) {
        x++;
        if (fork() == 0)
            x++;
        else
            wait(NULL);
    }
    else
        wait(NULL);
    printf("%d ", x);
}
```

Subject: operating systems

Max Marks: 1

For the above program, what could be one of the correct output sequence?

A

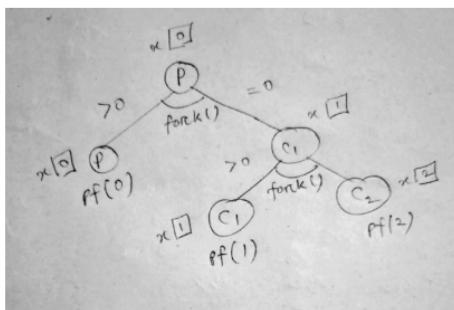
2 1 0

Correct Option

Solution: (A)

Explanation:

The parent process P, child processes C1 and C2 will print the value of x as 0, 1 and 2 respectively.

**B**

2 0 1

C

1 0 0

D

None of the above

Q.2)

The minimum number of states in a dfa for language $L = \{ba^n : n \geq 1, n \neq 5\}$ is _____

Subject: Theory of Computation,Compiler Design

Max Marks: 1

A

6

B

7

C

8

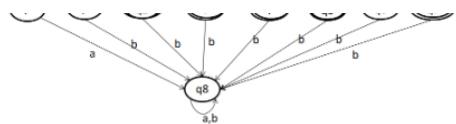
D

9

Correct Option

Solution: (D)

Explanation:



Q.3)

Subject: operating systems

Max Marks: 1

Suppose that an operating system uses preemptive round-robin scheduling with a scheduling quantum of 500 milliseconds. The hardware clock generates timer interrupts once every millisecond. Suppose that a process P is scheduled to run and is dispatched. During its quantum, P makes no system calls. However, address translation exceptions due to TLB misses occur once every 10 milliseconds while P is running. The number of times during its quantum does process P's thread enter the kernel is ____.



Correct Answer

Solution: (550)

Explanation:

Each exception and interrupt causes control to enter the kernel.

There will be 500 timer interrupts during P's quantum, and there will be $500/10 = 50$ address translation exceptions, for a total of 550 kernel entries.

Q.4)

Subject: Algorithms

Max Marks: 1

Which of the following algorithms behaves in the best manner if the array of elements is already sorted?



Quick Sort



Bubble Sort

Correct Option

Solution: (B)



Merge Sort



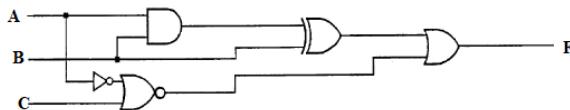
Selection Sort

Q.5)

Subject: digital logic systems

Max Marks: 1

Consider the below given circuit:



The value of variable A, given the value of B, C and F as 1 will be _____



Correct Answer | Attempted

Solution: ()

Solution: 0

For the given circuit, the function F could be represented as: $(AB \oplus B) + (A' + C)'$
Since $F = B = C = 1$, then A will be:

$$\Rightarrow (A \cdot 1 \oplus 1) + (A' + 1)' = 1$$

$$\Rightarrow (A \oplus 1) + (1)' = 1$$

$$\Rightarrow A' + 0 = 1$$

$$\Rightarrow A' = 1$$

If $A' = 1$ then A will be 0.

Q.6)

Subject: computer organization

Max Marks: 1

A hierarchical cache memory-MS subsystem has following specifications. i. Cache access time of 50nsec; ii. Main storage access time of 500 nsec iii. 80% of memory request are for read; iv. Hit ratio of .9 for read access and the write through scheme employed. Estimate the average access time of the system considering only memory read cycle.



Correct Answer

Solution: (100)

Answer:100**Explanation:**

The average access time of the system considering only memory read cycle
is

$$\text{Average access time} = H \cdot T_c + (1-H)(T_c + T_m) = .9 \cdot 50\text{ns} + .1 \cdot (50 + 500) \text{ ns} = 100 \text{ nsec}$$

Q.7)

Consider the relation Customer(cid, age) and Product(pid, cid);

Subject: DBMS

Max Marks: 1

Relation Customer:

Cid	Age
C1	19
C2	19
C3	21
C4	21
C5	18

Relation Product:

Pid	Cid
P1	C1
P2	C1
P1	C3
P2	C3
P3	C4

```
SELECT C.cid, COUNT(*)
FROM Product P, Customer C
WHERE C.age >= ALL ( SELECT age FROM Customer WHERE age > 21 )
GROUP BY C.cid;
```

The number of tuples in the result set are _____

Correct Answer

Solution: (5)

Solution: 5

The inner query (SELECT age FROM Customer WHERE age > 21) will return an empty set and we know that ALL returns true if all of the sub query values meet the condition. Hence, the final query which will get executed will be:

```
SELECT C.cid, COUNT(*)
FROM Product P, Customer C
WHERE C.age >= ALL (empty set)
GROUP BY C.cid;
```

Hence, all the distinct cid will be there in the result set. Since there are 5 cid and all of them are distinct. Hence, the result set will contain 5 tuples.

Q.8)

Match the following

Subject: Algorithms

Max Marks: 1

List-1	List-2
1. Quick Sort	A. Dynamic Programming
2. Dijkstra's Single Source shortest Path	B. Greedy Approach
3. Floyd Warshall	C. Divide and Conquer
4. Bellman-Ford	
5. Job Sequencing with deadlines	

A

1-C, 2-B, 3-A, 4-A, 5-B

Correct Option

Solution: (A)

Solution:

The correct matching of the option is given by option A.

B

1-C, 2-A 3-A, 4-A, 5-B

C

1-C, 2-A 3-A, 4-B, 5-B

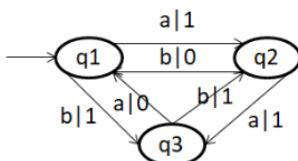
D None of the above

Q.9)

The output produced by the given finite state machine for the input string bbbbaaa

Subject: Theory of Computation,Compiler Design

Max Marks: 1



A

1101110

B

110110

Correct Option

Solution: (B)

Explanation:

$(q_1, b) = (q_3, 1) \Rightarrow o/p \text{ is } 1$
 $(q_3, b) = (q_2, 1) \Rightarrow 1$
 $(q_2, b) = (q_1, 0) \Rightarrow 0$
 $(q_1, a) = (q_2, 1) \Rightarrow 1$
 $(q_2, a) = (q_3, 1) \Rightarrow 1$
 $(q_3, a) = (q_1, 0) \Rightarrow 0$
 $\Rightarrow 110110$

C

111000

D

None of these

Q.10)

Subject: Theory of Computation,Compiler Design

Max Marks: 1

Which of the following is/are True

- I. Recognizable sets are closed under complement.
- II. There is a decidable but not recognizable language.
- III. Decidable sets are closed under complement.
- IV. There is a recognizable but not decidable language.

A

I and II Only

B

II and III Only

C

II, III and IV Only

D

III and IV Only

Correct Option

Solution: (D)

Explanation:

- I. Recognizable sets are closed under complement. **False**
I. A_{TM} is recognizable but its complement is not recognizable.
- II. There is a decidable but not recognizable language. **False**
I. For any language, if it is decidable, then it is also recognizable
- III. Decidable sets are closed under complement. **True**
I. We just need to flip the accept states and reject states.
- IV. There is a recognizable but not decidable language. **True**
I. A_{TM} is recognizable but not decidable

Q.11)

Subject: C Programming

Max Marks: 1

What is the Output of the C code?

Note: int takes up to 4bytes of memory

```
#include <stdio.h>
void main()
{
    int x = 9;
    int y = sizeof(x++);
```

```

        printf("%d", x);
    }

```

9

Correct Option

Solution: (A)**Solution:**

The expression is used only for getting the type of operand and not evaluated.

B

10

C

4

D

None of the above

Q.12)

At a party, everyone shook hands with everybody else. There were 66 handshakes. How many people were at the party?

Subject: Engineering-Mathematics

Max Marks: 1

Correct Answer

Solution: (12)**Solution:** 12 $C(n,2)=66$ $n(n-1)/2=66$ $n=11 \text{ or } 12. -11 \text{ is not possible therefore } 12 \text{ is the correct answer.}$

Q.13)

Subject: Discrete Mathematics

Max Marks: 1

Suppose A is a non-empty set containing n elements and B is a non-empty set containing m elements. Remember that $P(S)$ denotes the power set of a set S .Under what conditions is $|P(A \times B)| = |P(A)||P(B)|$?

A

 $mn = m + (1+n)$

B

 $m/n = m + n$

C

 $mn = m + (n+n)$

D

 $mn = m + n$

Correct Option

Solution: (D)**Explanation:**A X B contains mn elements. So, its powerset contains $2^{(mn)}$ elements.Therefore, $|P(A \times B)| = 2^{(mn)}$ $|P(A)|$ is 2^m and $|P(B)|$ is 2^n Therefore, $|P(A)| |P(B)| = 2^{(m+n)}$ So the condition is asked under which $|P(A \times B)| = |P(A)| |P(B)|$

That is, when is $2^{mn} = 2^{m+n}$? This will be exactly when $mn = m + n$. This can only happen when $m = \frac{n}{n-1}$. Since m and n are supposed to be positive integers, this happens only when $n = m = 2$.

The problem specified that the two sets were non-empty, so m and n can't be zero. Otherwise, this would be another situation where $mn = m + n$.

Q.14)

Subject: Discrete Mathematics

Max Marks: 1

Which of the following propositions are true or false.

S1 : $\exists x \in \mathbb{N}, \forall y \in \mathbb{N}, \text{GCD}(x, y) = 1$ S2 : $\forall x \in \mathbb{Z}, \exists y \in \mathbb{Z}, x = y^2$

A

S1 is False, S2 is True

B

S1 is True, S2 is True

C

S1 is False, S2 is False

D S1 is True, S2 is False

Correct Option

Solution: (D)

Explanation:

S1: True.

Let $x=1$. Note that for every $y \in \mathbb{N}$, $\text{GCD}(1, y) = 1$.

Notice that $\text{GCD}(1, 0)$ is also equal to 1, because 1 divides zero.

GCD is not defined when both inputs are zero, but in this case we are safe because we've forced one of them to be non-zero.

S2: False.

Let $x=2$. Note that there is no $y \in \mathbb{Z}$ such that $2 = y^2$.

Q.15)

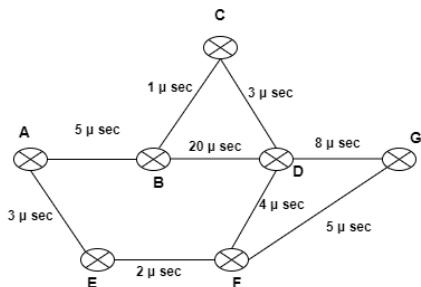
Subject: Computer Networks

Max Marks: 1



We have 6 stations in network A to G and also propagation delay between stations is mentioned in the figure.

Ignore the effect of all other delays, Calculate the minimum delay cost X of the spanning tree and shortest delay cost Y to reach A to G. [Note: Write your answer in terms of X+Y in a micro sec]

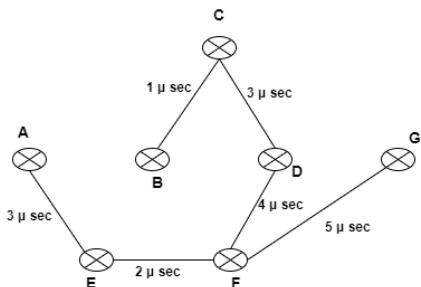


Correct Answer

Solution: (28)

Explanation:

The required spanning tree is:



Cost of spanning-tree = 18 micro sec = X

Shortest delay from A to G is = 3+2+5= 10micro sec

X+Y = 28 micro sec

Q.16)

Which of the following is/are True

Subject: Theory of Computation, Compiler Design

Max Marks: 1



A

The number of states in the SLR(1) parser is always same as CLR(1) parse table

B

The number of states in the LR(0) parser is same as LALR(1) parse table

Correct Option

Solution: (B)

Explanation:

- A. The number of states in the SLR(1) parser is always same as CLR(1) parse table: Not always True. There might be more number of states in the CLR(1) parser due to the lookahead symbols.

- B. The number of states in the LR(0) parser is same as LALR(1) parse table. True.

In LALR(1) parser we will combine the states with the same state and different lookahead symbols. Resulting as number of states similar to LR(0) or SLR(1).

- C. If there exists a R/R conflict in LR(0) then SLR(1) parser also must contain R/R Conflict. Not always True

- D. If there is no R/R conflict in CLR(1) parser, then there is

no R/R conflict in LALR(1) parser. Not Always True.
After merging the states there might be the chance of getting the R/R conflicts

c If there exists a R/R conflict in LR(0) then SLR(1) parser also must contain R/R Conflict

d If there is no R/R conflict in CLR(1) parser, then there is no R/R conflict in LALR(1) parser

Q.17)

Consider the following statements:

S1 : The scheduler is the part of an Operating System that determines the priority of each process.

S2: The working set model is used to compute the average number of frames a job will need in order to run smoothly without causing thrashing

Which of the above statements are true?

a Only S1

b Only S2

c Both S1 and S2

d None of the above

Subject: operating systems

Max Marks: 1



Solution: (D)

Answer:

S1: FALSE.

The scheduler schedules processes based on user-specified priorities.

S2: FALSE.

The working set model is used to compute the minimum (total) number of frames a job will need in order to run smoothly without causing thrashing.

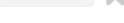
Correct Option

Q.18)

Consider a byte-addressable computer with 24-bit addresses, a cache capable of storing a total of 64K bytes of data and blocks of 32 bytes. The difference between the number of TAG bits in the Associative and 4-way set associative memory is_____

Subject: computer organization

Max Marks: 1



Solution: (3)

Answer: 9

Explanation:

Number of cache lines = 64KB/32B = 2K

Number of sets in 4-way set associative cache = $2K/4 = 512 \Rightarrow 9$ bits for Set Index

Number of bits in the offset = 32B $\Rightarrow 5$

Physical address is 24-bits

Number of TAG bits in the associative cache = $24-5=19$

Number of TAG bits in the 4-way set associative cache = $24-9-5 = 10$

\Rightarrow The difference between the number of TAG bits = $19-10 = 9$

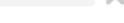
Correct Answer

Q.19)

How many times GATEAPPLIEDCOURSE.COM is printed?

Subject: C Programming

Max Marks: 1



```
int main()
```

```
{
```

```
    int a = 0;
```

```
    while(a++);
```

```
{
```

```
    printf("GATEAPPLIEDCOURSE.COM");
```

```
}
```

```
    return 0;
```

```
}
```

a 0

b 1

Correct Option

Solution: (B)

Solution: 1 times

Here while loop is evaluated as while(0) because it has post increment operator. And since while(0) is terminated by ; so printf() will not be part of it and hence it is printed 1 time.

c Infinite times

D Error

Q.20)

Which of the following is the correct representation of the $(-999)_{10}$ in octal?

Subject: digital logic systems

Max Marks: 1

A $(6180)_8$

B $(0031)_8$

C $(6031)_8$

Correct Option

Solution: (C)

Solution:

The representation of $(999)_{10}$ in binary will be $(1111100111)_2$

Since the conversion of 999 in binary is having 10 bits while all the options are having 12 bits, therefore , we need to append 2 zeros at MSB, hence, the number will be given as: $(001111100111)_2$

The 2's complement of this number will be: 1'st complement + 1 = $(110000011000)_2 + 1 = (110000011001)_2$.

The octal representation of $(110\ 000\ 011\ 001)_2 = (6031)_8$. Hence, the correct option is (iii)

D $(6030)_8$

Q.21)

You want to build an email address miner that scans a hard drive looking for email addresses, then sends them to a remote host.

Subject: Data Structures

Max Marks: 1

A Arrays

B Hash Table

Correct Option

Solution: (B)

Solution: Hash Table

C Trees

D Linked List

Q.22)

Server A runs a web server on port 80 and an FTP server on port 21. Client 1 opens local port 5001 to establish a TCP session to the web server on Server A. Client 2 opens local port 5002 to establish a TCP session to the FTP server on Server A. What are the numbers of the destination and source ports in the TCP segments sent to the server?

Subject: Computer Networks

Max Marks: 1

A Client 1 D=21 S=5001, Client 2 D=80, S=5002

B Client 1 D=80, S=5001, Client 2 D=21, S=5002

Correct Option

Solution: (B)

Explanation:

Server A port = 80

FTP server port=21

Client 1 port=5001

Client 2 port=5002

Client 1 sends is interacting with web server

Client uses dynamic ports= 5001

Destination port = 80

Client 2 is interacting with FTP server

Client port:= 5002

FTP server port=21

C Client 1 D=21,S=5002, Client 2 D= 80, S= 5001

D Client 1 D=80,S=5001,Client 2 D=80 S=5002

Q.23)

Consider the 3 schedules given below:

Subject: DBMS

Max Marks: 1

S1: R1(X); W2(X); W3(X); C3; R2(X); R2(Y), W3(Y); C3; R1(Y);

S2: W2(X); R1(X); W3(X); C3; R2(X); R2(Y); W3(Y); R1(Y); C3;

S3: W2(X); W3(X); C3; R1(X); R2(X); R2(Y); W3(Y); R1(Y); C3;

Which of the above schedules are conflict serializable?

Note: None of the schedule is conflict serializable. Thus, n of the option is correct.

- A \$1 and \$2
- B \$2 and \$3
- C \$1 only

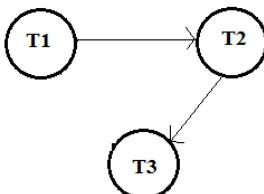
- D \$1 and \$3

Correct Option

Solution: (D)

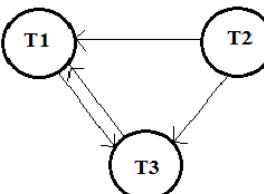
Solution:

The precedence graph of schedule \$1 is:



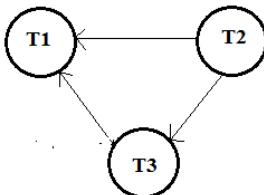
Since, R2(X) and R1(Y) are performed after committing the updated value, therefore, they will not result in dirty read. Thus, \$1 is conflict serializable.

The precedence graph of schedule \$2 is:



Since it results in a cycle due to uncommitted read of R1(Y) of value written by W3(Y), therefore, it is not conflict serializable.

The precedence graph of schedule \$3 is:



Since the value read by R2(X) and R3(Y) are committed, therefore, the schedule \$3 is conflict serializable.

Q.24)

Subject: Computer Networks

Max Marks: 1

Host A is transferring a large file to host B over a 10 gigabit-per-second link. This link has a one-way latency of 10msec. How big would the sliding window have in order to "fill the pipe"? That is, how large does the window have to be in order to take advantage of the full link bandwidth, assuming there is no other traffic on the link?

- A 10^8 bytes
- B 10^8 bits
- C 2×10^8 bytes

- D 2×10^8 bits

Correct Option

Solution: (D)

Explanation:

Round trip time = 20 msec

In 1 sec = 10 G bits = 10^{10} bits

In 20 msec = $20 \times 10^{-3} \times 10^{10}$ bits = 2×10^8 bits.

Window size = 2×10^8 bits to take advantage of the full link bandwidth.

Q.25)

Subject: C Programming

Max Marks: 1

.What is the following function foo doing?

```
int foo(int n)
```

```
{
```

```

int t = 1;
for( ; t<=n; t=t<<1)
    n = n^t;
return n;
}

```

- A** Toggle all bits after least significant bit
- B** Toggle all bits after most significant bit Correct Option
- C** Toggle all even bits of the given number
- D** Toggle all odd bits of the given number

Q.26)

What is the total number of abelian groups (up to isomorphism) of order 4900 is ___

Subject: Discrete Mathematics

Max Marks: 2

Correct Answer

Solution: (8)

Explanation:

$$4900 = 7^2 \cdot 5^2 \cdot 2^2$$

The following groups are abelian, and have the order 4900:

- $\mathbb{Z}_{49} \times \mathbb{Z}_{25} \times \mathbb{Z}_4$
- $\mathbb{Z}_7 \times \mathbb{Z}_7 \times \mathbb{Z}_{25} \times \mathbb{Z}_4$
- $\mathbb{Z}_{49} \times \mathbb{Z}_5 \times \mathbb{Z}_5 \times \mathbb{Z}_4$
- $\mathbb{Z}_{49} \times \mathbb{Z}_{25} \times \mathbb{Z}_2 \times \mathbb{Z}_2$
- $\mathbb{Z}_7 \times \mathbb{Z}_7 \times \mathbb{Z}_5 \times \mathbb{Z}_5 \times \mathbb{Z}_4$
- $\mathbb{Z}_{49} \times \mathbb{Z}_5 \times \mathbb{Z}_5 \times \mathbb{Z}_2 \times \mathbb{Z}_2$
- $\mathbb{Z}_7 \times \mathbb{Z}_7 \times \mathbb{Z}_{25} \times \mathbb{Z}_2 \times \mathbb{Z}_2$
- $\mathbb{Z}_7 \times \mathbb{Z}_7 \times \mathbb{Z}_5 \times \mathbb{Z}_5 \times \mathbb{Z}_2 \times \mathbb{Z}_2$

Due to Fundamental Theorem of Finitely Generated Abelian Groups, all these groups are pairwise non-isomorphic, and any abelian group of order 4900 is isomorphic to one of the groups above. \square

Q.27)

Which of the following functions are continuous over the set of real numbers \mathbf{R} .

Subject: Engineering-Mathematics

Max Marks: 2

$$f(x) = \begin{cases} x^2, & x < 2 \\ x + 2, & x \geq 2 \end{cases}$$

$$g(x) = \begin{cases} x^2, & x < 2 \\ x^2 + 1, & x \geq 2 \end{cases}$$

$$h(x) = \begin{cases} x^2, & x < 2 \\ (x - 4)^2, & x \geq 2 \end{cases}$$

$$i(x) = \begin{cases} x^2, & x < 2 \\ 0, & x = 2 \\ 4, & x > 2 \end{cases}$$

Correct Answer

Solution: (2)

Solution: 2

f(x) at x=2

Left hand limit $\lim_{x \rightarrow 2^-} f(x) = 4$

Left hand limit $\lim_{x \rightarrow 2^+} f(x) = 4$

f(2)=4

The function is continuous at x=2 and is continuous over R.

g(x) at x=2

Left hand limit $\lim_{x \rightarrow 2^-} g(x) = 4$

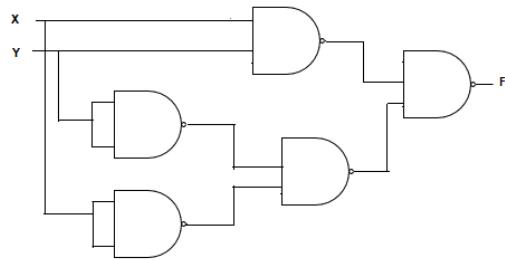
Left hand limit $\lim_{x \rightarrow 2^+} g(x) = 5$

g(x) is not continuous at x=2.

$h(x)$ at $x=2$
 Left hand limit $\lim_{x \rightarrow 2^-} h(x) = 4$
 Left hand limit $\lim_{x \rightarrow 2^+} h(x) = 4$
 $h(2)=4$
 $h(x)$ is continuous over R.
 $i(x)$ at $x=2$
 Left hand limit $\lim_{x \rightarrow 2^-} i(x) = 4$
 Left hand limit $\lim_{x \rightarrow 2^+} i(x) = 4$
 $i(2)=0$
 $i(x)$ is not continuous at $x=2$.

Q.28)

Which of the following statements is true about the given circuit?



- I. The value of the function F will be 1 only when inputs are equal.
- II. Number of NOR gates required to implement the given circuit are 4.

A Only I

B Only II

C Both I and II

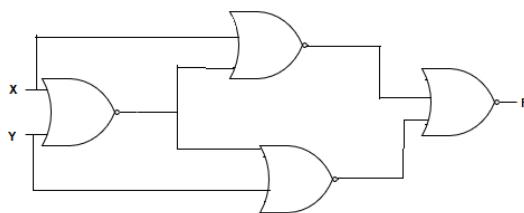
Correct Option

Solution: (C)

Solution:

The given circuit is NAND-NAND representation of EX-NOR gate and in EX-NOR the output will be 1 only for an even number of 1's in the input. But for the given circuit we have only 2 inputs X and Y and F will be 1 when $X = Y$. Hence, this statement is true.

The NOR gate implementation will be:



Hence, 4 NOR gates are required.

D Neither I nor II

Q.29)

Suppose you have a pipeline machine with a 10 stage pipeline and a program with 1000 instructions whose dependencies are such that the pipeline does not stall. If each stage of the pipe takes 1 cycle what is the speedup gained by the pipelined processor compared to the program on the same machine without exploiting the pipeline. (You may assume that there is no extra overhead when operating the machine in a non-pipelined fashion.)

Correct Answer

Solution: (9.91)

Answer: 9.91

Explanation:

The time without pipelining is $T_{np} = \text{stages} \times \text{instructions} = 10 \times 1000 = 10000$

When pipeline is used the first result appears after 10 cycles and the remaining 999 appear one cycle after that. So the pipelined time of $T_p = 10 + 999 = 1009$

The speedup = $10000/1009 = 9.91$

Q.30)

If the order of a B-Tree is 20, then the minimum number of levels needed to store 15,998 keys are _____

Subject: DBMS

Max Marks: 2

Correct Answer

Solution: (4)**Solution:** 4

Since, the order given as 20, therefore the number of keys at each level will be 19.
At Level 0, number of keys is: 19
At Level 1, number of keys is: $19 * 20 = 380$
At Level 2, number of keys is: $19 * 20 * 20 = 7600$
Since, keys at level 0 + 1 + 2 = $19 + 380 + 7600 = 7,999$, therefore we need one more level
At Level 3, number of keys is: $19 * 20 * 20 * 20 = 152000$
Hence, we need a total of 4 levels minimum to store 15,998 keys.

Q.31)

Consider a relation $S = (W, X, Y, Z)$. For which of the following sets of FD's in S is in BCNF?

Subject: DBMS

Max Marks: 2

A{WXY \rightarrow Z, WYZ \rightarrow X, Z \rightarrow Y, XYZ \rightarrow W}**B**{WZ \rightarrow Y, XY \rightarrow W, XZ \rightarrow Y, YZ \rightarrow X}**C**{WY \rightarrow Z, Z \rightarrow W, Z \rightarrow X, Z \rightarrow Y}

Correct Option

Solution: (c)**Solution:**

For (i): The candidate keys are WXY, WYZ and XYZ. Thus, for FD $Z \rightarrow Y$, the LHS is not the super key. Therefore, it is not in BCNF.
For (ii): The candidate keys are WZ, XZ and YZ. Thus, for FD $XY \rightarrow W$, the LHS is not the superkey. Therefore, it is not in BCNF.
For (iii), The candidate keys are WY and Z. Thus, all the FD's satisfies the BCNF condition and thus it is in BCNF.
For (iv), the candidate key is Y, therefore, FD $WY \rightarrow X$, $W \rightarrow Z$, $Z \rightarrow X$ is not in BCNF.

Thus, the correct option is (iii).

D{WY \rightarrow X, W \rightarrow Z, Y \rightarrow W, Z \rightarrow X}

Q.32)

Which of the following statements are true?

Subject: Computer Networks

Max Marks: 2

A

TCP is always better than UDP for an application except for the fact that the overhead for TCP is larger.

B

UDP error detection mechanism can detect all errors but cannot correct them.

C

The throughput of a stop-and-go protocol is almost always limited by the round trip time rather than the actual link capacity available.

Correct Option

Solution: (c)**Explanation:**

No TCP is not always better than UDP because TCP connection establishment consumes time.
UDP error detection mechanism can not detect all errors
Yes throughput depends on the round trip time because we are not able to utilize the capacity of link because of sending one packet in Round trip time.
Yes stop and wait uses 1 bit of sequence number 0 and 1 alternatively.

D

A stop-and-go protocol does not need sequence numbers for the packets since only one packet is "in-flight" at all times.

Q.33)

Consider the following FCFS, SCAN, SSTF disk scheduling algorithms. Rank them according to fairness. Rank them according to response time.

Subject: operating systems

Max Marks: 2

List 1 (most fair to least fair) : FCFS > SCAN > SSTF.
List 2 (quickest to slowest) : SSTF > SCAN > FCFS

Which of the above list(s) is/are correct?

A Only List 1 is correct

B Only List 2 is correct

C Both List 1 and List 2 are incorrect

D Both List 1 and List 2 are correct

Correct Option

Solution: (D)

Explanation:

Algorithms from fairest to least fair: FCFS, SCAN, SSTF.

FCFS is clearly fairest since it services the first in line first.

SCAN: The drive head sweeps across the entire surface of the disk, visiting the outermost cylinders before changing direction and sweeping back to the innermost cylinders.

It selects the next waiting request, whose location it will reach on its path backward and forward across the disk. Thus the movement time should be less than FCFS but the policy is clearly fairer than SSTF.

SSTF is least fair since it can starve requests when continual new requests come in for closer locations.

Algorithms from quickest to slowest response time: SSTF, SCAN, FCFS.

Although, SSTF is not optimal, it is faster than the other 3 because it services the closest request first. SCAN must go in one direction or the other, and may thus zig zag more than SSTF which can always choose the shortest distance to move.

Q.34)

Subject: computer organization

Max Marks: 2



Assume we have the same DLX pipeline has multiplier takes 10 cycles, the FP adder takes 5 cycles, and the divider takes 20 cycles to complete its computation. Assume that the pipeline has the stages of IF, ID, EX, MEM, WB.

DIVF F0, F2, F4

DIVF F6, F8, F10

ADDF F0, F0, F6

SUBF F6, F4, F10

After mechanisms are installed to avoid the pipeline hazards, how many clock cycles are needed to execute the above code, including all the pipe stages?

Correct Answer

Solution: (54)

Answer: 54

Explanation:

	1	2	3	4	22	23	24	42	43	44	47	48	49	52	53	54
DIVF F0,F2,F4	IF	ID	EX	EX	EX	MEM	WB									
DIVF F6,F8,F10	IF	ID	S	S	EX	EX	EX	MEM	WB							
ADDF F0, F0, F6	IF	S	S	ID	S	S	EX	EX	EX	MEM	WB					
SUBF F6, F4, F10		S	S	IF	S	S	ID	S	S	EX	EX	EX	MEM	WB		

Q.35)

Subject: Data Structures

Max Marks: 2



Suppose that the following keys are inserted in some order into an initially empty linear-probing hash table.

key	hash
A	1
D	5
L	6
M	0
N	1
S	6
X	4

Following is the resultant hash table:

0	1	2	3	4	5	6
S	M	N	A	X	D	L

If the initial size of the hash table was 7, which of the following keys is definitely not the last key inserted? (Assume that the hash table did not grow or shrink.)

A A

B X

C L

Correct Option

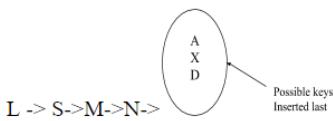
Solution: (C)

Solution: L

Resultant hash table is

0	1	2	3	4	5	6

S	M	N	A	X	D	L
---	---	---	---	---	---	---



D

D

Q.36)

A computer has 32-bit virtual addresses and 4-KB pages. The program and data together fit in the lowest page (0-4095). The stack fits in the highest page.

How many page table entries are needed for two-level paging, with 10 bits in each part?

A

1K entries

B

2K entries

C

3K entries

Correct Option

Solution: (c)**Explanation:**

For two-level paging, the main page table has 1K entries, each of which points to a second page table. Only two of these are used. Thus in total only three page tables are needed, one in the top-level table and one in each of the lower-level tables, with 3K entries in total.

D

None of the above

Q.37)

Consider the following two statements:

S1 : G be a k-connected graph. If G' is obtained from G by adding a new vertex V adjacent to at least k vertices of G, then G' is k-connected.

S2 : A graph G on at least k+1 vertices is k-connected if and only if G-X is connected for every vertex set X of size k-1.

Which of the above statements are True?

A

S1 only

B

S2 only

C

Both S1 and S2

Correct Option

Solution: (c)**Answer:****S1:**

Solution: Let S be such that G' - S is disconnected. Let us show that |S| $\geq k$. Assume the contrary that |S| $\leq k-1$. If $V \in S$, then $G - (S \setminus V)$ is disconnected as well. Since G is k-connected then $|S| > |S \setminus V| \geq k$. This is a contradiction. If $V \notin S$ then $G - S$ is connected (by k-connectivity of G) and, since the degree of V is at least k, then V is adjacent for at least one vertex of $G - X$. Hence, $G' - S$ is connected. This is a contradiction.

S2:

Solution: \Rightarrow : By the definition of k-connectivity, if G is k-connected then $G - X$ is connected for every set X of size $k-1$.

\Leftarrow : Assume the contrary that $G = (V, E)$ is not k-connected. Then there is a set of vertices Y such that $|Y| \leq k-1$ and the graph $G - Y$ is disconnected. Hence, there are two vertices x and y, which lie in different connected components. We obtain set Y' from Y by adding $k-1-|Y|$ vertices to Y from $V \setminus \{x, y\}$. Then $G - Y' \supset \{x, y\}$ is a disconnected graph and $|Y'| = k-1$. This is a contradiction.

D

None of the above

Q.38)

Let $S = \{1, 2, 3, 4, 5\}$ and let $f, g, h : S \rightarrow S$ be the functions defined by

Subject: Discrete Mathematics

Max Marks: 2

$$f = \{(1, 2), (2, 1), (3, 4), (4, 5), (5, 3)\}$$

$$g = \{(1, 3), (2, 5), (3, 1), (4, 2), (5, 4)\}$$

$$h = \{(1, 2), (2, 2), (3, 4), (4, 3), (5, 1)\}$$

Which of the following options are correct for the above functions?

A The inverse of f and h exists

B The inverse of g and h exists

C The inverse of f and g exists

Correct Option

Solution: (C)

Explanation:

$$f^{-1} = \{(1, 2), (2, 1), (3, 5), (4, 3), (5, 4)\}; g^{-1} = \{(1, 3), (2, 4), (3, 1), (4, 5), (5, 2)\}$$

Functions f and g have inverses because they are one-to-one and onto while h does not have an inverse because it is not one-to-one (equally because it is not onto).

D None of the above

Q.39)

Order the following operations in decreasing order of time complexity

Sorting n numbers in decreasing order by using comparison based sorting

Sorting n numbers in decreasing order by using radix sort (assume the number of digits is small when compared to the number of elements.

Maximum number of inversions possible for a set of n elements

Merging two sorted lists into one sorted list.

Subject: Algorithms

Max Marks: 2

A 3, 1, 2, 4

Correct Option

Solution: (A)

Solution:

1. Sorting n numbers in decreasing order using comparison based sorting takes $O(n\log n)$
2. Sorting n numbers in decreasing order by using radix sort requires $O(kn)$ where k is the number of digits- $O(n)$
3. Maximum number of inversions possible are in an array of n elements are $n(n-1)/2$ in case of an array arranged in descending order. $O(n^2)$.
4. Merging two sorted lists into one sorted list would take $O(n)$ time where n is the total number of elements.

The orders which correctly describes in decreasing order of time complexity 3, 1, 2, 4.

B 3, 2, 1, 4

C 3, 1, 4, 2

D None of the above

Q.40)

On any given Sunday, Sam initiates a connection with his girlfriend Alice in order to plan out what movie they're going to watch on Tuesdays with Morrie. This Sunday, immediately after Sam initiates the connection, Alice decides to send him a 60 KB picture using TCP. Assuming she sends the picture in 2500 byte segments including a 50-byte header over a 2 Mbps link with a propagation delay of 30 ms, what is the total time difference between when Sam initiates the connection to when Alice receives the last ACK? The TCP implements a slow-start mechanism with an initial congestion window of 1. Neglect queuing and processing delays at both the sender and receiver, and assume there are no losses.

Subject: Computer Networks

Max Marks: 2

A 550 ms

B 640 ms

Correct Option

Solution: (B)

Explanation:

Let T_{prop} be one-way propagation delay,

T_{trans} be transmission time of one 2500 byte packet

$T_{prop} = 30 \text{ ms}$

$T_{trans} = (2500 \text{ bytes} * 8 \text{ bits}/\text{byte}) / (2 * 10^6 \text{ bits}/\text{second}) = 10 \text{ ms}$

$T_{3\text{-way handshake}} = 3 * T_{prop} = 90 \text{ ms}$

Size of data in segment = TCP segment - the size of header = 2450 bytes.

A number of packets needed to transfer a 60 KB file = $(60 * 1000) / 2450 = 25 \text{ packets}$.

Hence, the window size grows as slow start phase

1, 2, 4, 8, 10.

Hence, the total time to transfer the packet after the 3-way handshake is:

$T_{data} + 3 * T_{prop} + T_{3\text{-way handshake}}$

Tdata = 25 Packet transfer time T2 PTA(5 windows)

$$\begin{aligned} &= 25 \times 10 + 2 \times 30 \times 5 \\ &= 250 + 300 \\ &= 550 \text{ ms} \end{aligned}$$

Hence, total time to transfer = T3-way-handshake + Tdata = 90 ms + 550 ms = 640ms

C 600 ms

D 450 ms

Q.41)

Consider the following program

```
int foo(int n)
{
    int p=1;
    int c;
    for(c=1; !(n&c); c=c<<1)
        p++;
    return p;
}
```

What is the equivalent behaviour of function foo()?

A Find the position of 1 in binary representation of an integer

B Find the position of first 1 from right to left, in binary representation of an integer

Correct Option

Solution: (B)

Solution:

Let's example of 16, the position of 1 in binary representation is 5.

Binary representation of 16 is 10000

Given c = 1, p=1;

1) Initially check the condition $n \& c = 0$ then $!(n \& c)$ is 1 (condition true)

p = 2

Now value of c = 2

2) Now check the condition $!(n \& c)$ is 1 (condition true)

p = 3

Now value of c = 4

3) Now check the condition $!(n \& c)$ is 1 (condition true)

p = 4

Now value of c = 8

4) now check the condition $!(n \& c)$ is 1 (condition true)

p = 5

Now value of c = 16

5) now check the condition $!(n \& c)$ is 0 (condition fail)

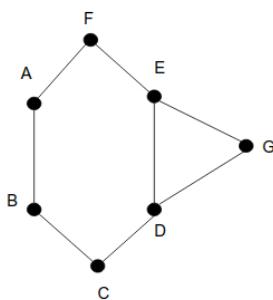
6) return p i.e 5 (which means the position of 1 present at the 5th location of the given number in binary representation)

C Find the position of second 1 from right to left in binary representation of an integer

D None of these

Q.42)

Which of the following is not a BFS traversal of the following graph



A, F, B, E, C, D, G

Subject: Algorithms

Max Marks: 2

A, B, F, C, E, D, G

G, D, E, C, F, A, B

Correct Option

Solution: (c)

Solution:

Starting from A we get B and F

Now exploring the neighbours of B we get C, next exploring the neighbours F we get E now exploring the neighbours of E we get G and the graph is completed, similarly if we explore the neighbours of B first we end up in option B.

Starting from G, E and D are neighbours of G exploring the neighbours of G we get F and exploring the neighbours of D we get C, and not when exploring the neighbours of E we get F now exploring the neighbours of C we should get B but in the option C we have A, therefore option C is wrong.

D G, D, E, C, F, B, A

Q.43)

Subject: digital logic systems

Max Marks: 2

Consider the following bit pattern of the IEEE 754 double precision floating point number. The value of the bit pattern in base 7 will be?

111111111110000000...11

A $+\infty$

B $-\infty$

C Not a Number

Correct Option

Solution: (c)

Solution:

The number given is:

1	000000...11	1111111111
<-----sign	bit(1)----->	<-----Mantissa

bit(52)-----><-----Exponent bit(11)----->

Here, all exponent bits are 1, therefore, there are two possibilities:

- 1) Either the number is $-\infty$
- 2) Or the number is NAN

Since the mantissa bits are non-zero, thus it is Not a Number.

D None of the above

Q.44)

Subject: Data Structures

Max Marks: 2

What is the output of the following program _____

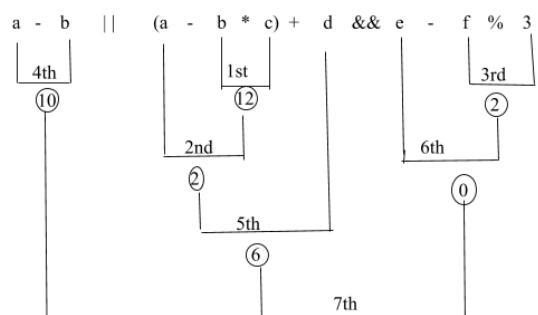
```
int main()
{
    int a, b, c, d, e, f, g, h, k;
    a=14, b=4, c=3, d=4, e=3, f=14;
    printf("%d", a-b || (a-b*c)+d && e-f %3);
    return 0;
}
```

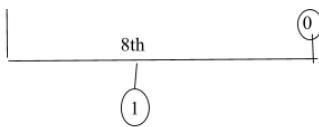
Correct Answer

Solution: (1)

Solution: 1

a=14, b=4, c=3, d=4, e=2, f=14





Q.45)

Consider the following context free grammar

$$\begin{aligned} S &\rightarrow 0 \mid 1 \ S \ S'' \\ S'' &\rightarrow 2 \ S \ 3 \mid A' \ 3 \\ A' &\rightarrow S \ A' \mid \epsilon \end{aligned}$$

Follow(S'') =

A

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

Correct Option

Solution: (A)

Explanation:

$$\begin{aligned} S &\rightarrow 0 \mid 1 \ S \ S'' \\ S'' &\rightarrow 2 \ S \ 3 \mid A' \ 3 \\ A' &\rightarrow S \ A' \mid \epsilon \end{aligned}$$

Follow(S'') = Follow(S)

Follow(S) = {\$} \cup \{3\} \cup \text{First}(A') \cup \text{First}(S'')

First(A') = First(S) $\cup \{\epsilon\} = \{0, 1\} \cup \{\epsilon\} = \{0, 1, \epsilon\}$

First(A') contains ϵ substitute ϵ in place of A' \Rightarrow Follow(S) = Follow

(A') = {3}

First(S'') = {2} \cup First(A') = {2} \cup {0, 1} = {0, 1, 2}

\Rightarrow Follow(S) = \${, 3} \cup \{0, 1, 2\} = \{0, 1, 2, 3, \\$\}

Follow(S'') = {0, 1, 2, 3, \$}

B

{0, 1, 2, 3, \$, ϵ }

C

{0, 1, 2, 3}

D

{0, 1, 3, \$}

Q.46)

The solution system of linear equations given by

$$2x+3y+z=15$$

$$x+y+z=7$$

$$21x+44y+11z=206$$

Subject: Engineering-Mathematics

Max Marks: 2

A

Unique and non trivial

Correct Option

Solution: (A)

Solution:

Calculating the determinant of the coefficient matrix we get it as -13, therefore the system of linear equations are not linearly dependent and the system of linear equations have a unique solution which is not trivial as the system of equations is not homogenous.

B

Infinitely many solutions exist

C

No solutions exist

D

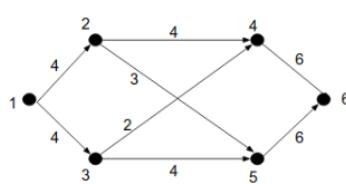
None of the above

Q.47)

The Shortest distance From vertex 1 to vertex 6 in the following graph as reported by Dijkstra's algorithm is _____

Subject: Algorithms

Max Marks: 2



Correct Answer

Solution: (12)

Solution:

On applying Dijkstra's Algorithm we get the shortest path as 1,3,4,6 and its cost is 12.

Q.48)

Let $G = (V, \Sigma, R, S)$ be the following grammar. $V = \{S, T, U\}$; $\Sigma = \{0, \#\}$ and R is the set of rules

$S \rightarrow TT \mid U$

$T \rightarrow 0T \mid T0 \mid \#$

$U \rightarrow 0U00 \mid \#$

The Language generated by the given grammar is

A

$\{0^i \# 0^j \mid i, j \geq 0\} \cup \{0^i \# 0^{2i} \mid i \geq 0\}$

B

$\{0^i \# 0^j \mid i, j \geq 1\} \cup \{0^i \# 0^{2i} \mid i \geq 1\}$

C

$\{0^i \# 0^j \mid i, j \geq 1\} \cup \{0^i \# 0^j \mid i, j \geq 1\} \cup \{0^i \# 0^{2i} \mid i \geq 1\}$

D

$\{0^i \# 0^j \mid i, j \geq 0\} \cup \{0^i \# 0^j \mid i, j \geq 0\} \cup \{0^i \# 0^{2i} \mid i \geq 0\}$

Correct Option

Solution: (D)

Explanation:

$00\#000$ is in the language as can be seen by the following derivation.

$S \Rightarrow TT \Rightarrow 0TT \Rightarrow 00TT \Rightarrow 00\#T \Rightarrow 00\#0T \Rightarrow 00\#0T0 \Rightarrow 00\#0T00 \Rightarrow$

$00\#000\ 0\#0$ is not derivable in the grammar because the only strings that can be generated with a single $\#$ -symbol are those from U . But then the strings obtained from U have at least two 0s after the $\#$ (if there are any 0s after the $\#$). String $000\#000000$ is derivable as follows. $S \Rightarrow U \Rightarrow 0U00 \Rightarrow 00U000 \Rightarrow 000U0000 \Rightarrow 000\#000000$

2. The strings derivable from T are $L_1 = \{0^i \# 0^j \mid i, j \geq 0\}$, and from U are $L_2 = \{0^i \# 0^{2i} \mid i \geq 0\}$. Thus, $L(G) = L_1 L_1 \cup L_2$

Q.49)

After throwing a dice with numbers 1 through 6 written on it, you get 4 dollars for an odd number and 10 dollars for an even number. Let random variable X

X be the prize you get after throwing the dice, then what is the expected value of X ?

A

11

B

9

C

13

D

7

Subject: Engineering-Mathematics

Max Marks: 2

Correct Option

Solution: (D)

Solution:

The odd numbers on the dice are 1, 3 and 5, and the even numbers are 2, 4 and 6. Thus, the probability of having an odd or even number is $\frac{1}{2}$.

Then the probability distribution of X is

$P(X=4)=\frac{1}{2} P(X=10)=\frac{1}{2}$

The expected value of $X=(\frac{1}{2})*4+(\frac{1}{2})*10=7$.

Q.50)

A computer uses DMA to read from its disk. Suppose that the disk has 32 500- byte sectors per track. The disk rotation time is 32

msec. The bus is 32 bits wide, and bus transfers take 500 nsec each. The average CPU instruction requires two bus cycles. How much is the CPU slowed down by DMA?

A

Correct Answer

Solution: (6.25)

Answer: 6.25

Explanation:

Bus width = 32 bits = 4 bytes.

Bus transfer rate = 500 nsec.

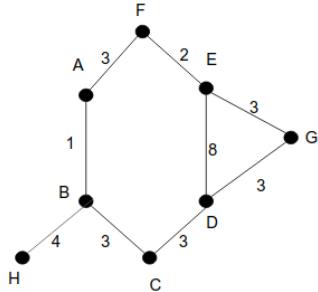
The disk rotation time is 32 msec. That means, to transfer entire data of a track, it requires 32 msec.

The amount of data in a track = $32 * 500$ byte = 16,000 bytes.

The time spent to transfer 16,000 bytes of data from disk = $32 * 10^{-9}$ s.
Transfer 1 byte of data takes $32 * 10^{-9}$ s / 16000 = 2000 nsec
So, time spent to transfer 4 bytes of data from disk = $4 * 2000 = 8000$ nsec.
Therefore, time spent by the CPU for 4 bytes = (required time – bus transfer time) = $(8000 - 500) = 7500$ nsec.
So the CPU takes = $(7500/8000) * 100 = 93.75\%$ Therefore due to DMA, the CPU is slowed down by $(100 - 93.75\%) = 6.25\%$

Q.51)

The Number of minimal spanning trees for the given graph is



Subject: Algorithms

Max Marks: 2

Correct Answer

Solution: (5)

Solution:

1. If the edge AF is present, then any of EG, DG, BC, DC must be present it can be done in $C(4,3)$ ways=4.
2. If the edge AF is absent then all EG, DG, BC, DC should be present.

The total number of MST possible are $4+1=5$.

Q.52)

The network technician is planning to use the 255.255.255.224 subnet mask on the network. Which three valid IP addresses can the technician use for the hosts?

Subject: Computer Networks

Max Marks: 2

- A. 172.22.243.127
- B. 172.22.243.191
- C. 172.22.243.190
- D. 10.16.33.98
- E. 10.17.64.34

A, C, E, A, D

B Only D, E

C C, D, E

Correct Option

Solution: (c)

Explanation:

A subnet mask is 27 host bits =5

A is false because last octet host bits contain 11111 which is not a valid host.

B is false because last 5 bits contain 11111 which is not valid host address

C is true because last 5 bits 11110 this is valid host bits

Similarly D, E is true

D A, D, E

Q.53)

Consider the following “Section” relational table

Subject: DBMS

Max Marks: 2

course_id	sec_id	semester	year	room_no
BIO-101	1	Summer	2009	514
BIO-301	1	Summer	2010	514
CS-101	1	Fall	2009	101
CS-101	1	Spring	2010	101
CS-190	1	Spring	2009	3128
CS-190	2	Spring	2009	3128
CS-315	1	Spring	2010	120
CS-319	1	Spring	2010	100
CS-319	2	Spring	2010	3128
CS-347	1	Fall	2009	2120

Course ID	Section ID	Semester	Year	Total
EE-181	1	Spring	2009	3128
FIN-201	1	Spring	2010	101
HIS-351	1	Spring	2010	514
MU-199	1	Spring	2010	101
PHY-101	1	Fall	2009	100

Using a set of operations, relation Section is transformed into the following table.

course_id
CS-347
PHY-101

Identify the correct representation of this transformation.

- A $\prod_{course_id} (\sigma_{semester="Fall" \wedge year=2009}(Section)) \cup \prod_{course_id} (\sigma_{semester="Spring" \wedge year=2010}(Section))$
- B $\prod_{course_id} (\sigma_{semester="Fall" \wedge year=2009}(Section)) \cap \prod_{course_id} (\sigma_{semester="Spring" \wedge year=2010}(Section))$
- C $\prod_{course_id} (\sigma_{semester="Fall" \wedge year=2009}(Section)) \times \prod_{course_id} (\sigma_{semester="Spring" \wedge year=2010}(Section))$
- D $\prod_{course_id} (\sigma_{semester="Fall" \wedge year=2009}(Section)) - \prod_{course_id} (\sigma_{semester="Spring" \wedge year=2010}(Section))$

Correct Option

Solution: (D)

Solution:

For query (i):

The first part of the query returns 3 rows which are:

course_id
CS-101
CS-347
PHY-101

The union of it with any other relation will definitely consists of course_id CS-101, therefore, it is not the correct option.

For query (ii):

The first of the query is the same as what we got above. The result of the second part of the query will be:

course_id
CS-101
CS-315
CS-319
FIN-201
HIS-351
MU-199

Since nothing is common in between them, therefore, intersection will result in empty set. Thus, it is a wrong option.

For query (iii):

The cross product of the each part of the query obtained above will not result in the requires set of tuples, thus it is the wrong option.

For query (iv):

The output of the first part of the query is:

course_id
CS-101
CS-347
PHY-101

The output of the second part of the query is:

course_id
CS-101
CS-315
CS-319
FIN-201
HIS-351
MU-199

The difference of both the result sets will result into:

course_id
CS-101
CS-347
PHY-101

Thus, it is the correct option.

Q.54)

Which of the following languages are context free

- I. $L = \{a^n w w^R a^n \mid n \geq 0, w \in (a+b)^*\}$
- II. $L = \{a^n b^j a^n b^j \mid n \geq 0, j \geq 0\}$
- III. $L = \{a^n b^j a^k b^l \mid n+j \leq k+l\}$

A I, II, III

B I and III only

Correct Option

Solution: (B)

Explanation:

- a. $L = \{a^n w w^R a^n \mid n \geq 0, w \in (a+b)^*\}$ CFL
We can apply push operation for all the symbols of a and w, then apply pop operation for each symbol in w^R and a^n .
- b. $L = \{a^n b^j a^n b^j \mid n \geq 0, j \geq 0\}$ Non-CFL
Need two stacks for storing all the symbols of a^n and b^j , and apply pop operation on stack1 for each symbol of a^n , followed by pop operation on stack2 for each b^j
- c. $L = \{a^n b^j a^k b^l \mid n+j \leq k+l\}$ CFL
Push all the symbols of $a^n b^j$ into the stack and start applying pop operation for each symbol of $a^k b^l$, if we are having more symbols in the tape after popping all the elements from the stack, then skip the remaining elements and accept.

C II and III only

D I and II only

Q.55)

Given the grammar $G = \{S, \{S, A, B\}, \{a, b, c, d\}, P\}$ with set of productions P below compute;

$S \rightarrow Aa$

| bAc

| Bc

| bBa

$A \rightarrow d$

$B \rightarrow d$

The given grammar is

A Both LR(0) and LR(1)

B Neither LR(0) nor LALR(1)

Correct Option

Solution: (B)

Explanation:

It is not LR(0) and SLR(1) as it contains the R/R conflict

$A \rightarrow d$.

$B \rightarrow d$.

Follow(A) intersection Follow(B) $\neq \{\Phi\}$

(a) LR(1) set of items

$I_0 = \text{closure}\{[S^* \rightarrow .S, \$]\}$
$S^* \rightarrow .S, \$$
$S \rightarrow .Aa, \$$
$S \rightarrow .bAc, \$$
$S \rightarrow .Bc, \$$
$S \rightarrow .bBa, \$$
$A \rightarrow .d, a$

$I_5 = \text{goto}(I_0, d)$
$A \rightarrow d, .a$
$B \rightarrow d, .c$
$I_6 = \text{goto}(I_2, a)$
$S \rightarrow Aa, .$
$I_7 = \text{goto}(I_3, c)$

$B \rightarrow .d, c$	$S \rightarrow Bc., \$$
$I1 = \text{goto}(I0, S)$ $S \rightarrow .S, \$$	$I8 = \text{goto}(I4, A)$ $S \rightarrow bA.c, \$$
$I2 = \text{goto}(I0, A)$ $S \rightarrow A.a, \$$	$I9 = \text{goto}(I8, c)$ $S \rightarrow bAc., \$$
$I3 = \text{goto}(I0, B)$ $S \rightarrow B.c, \$$	$I10 = \text{goto}(I4, B)$ $S \rightarrow bB.a, \$$
$I4 = \text{goto}(I0, b)$ $S \rightarrow b.Ac, \$$ $S \rightarrow b.Ba, \$$ $A \rightarrow .d, c$ $B \rightarrow .d, a$	$I11 = \text{goto}(I10, a)$ $S \rightarrow bBa., \$$ $I12 = \text{goto}(I4, d)$ $A \rightarrow d., c$ $B \rightarrow d., a$

In this particular case the only states that have common core items are states I5 and I12. If we merge them, however, we would get a state I512 with four items $A \rightarrow d ., \{a,c\}$ and $B \rightarrow d ., \{a,c\}$. This would mean that the corresponding parsing table would now have two reduce/reduce conflicts on the rules (5) and (6). This means that this particular grammar is not LALR(1).

C

SLR(1) and LALR(1)

D

Not SLR(1) but LALR(1)

Q.1)

Whenever Ram hears of a tragedy, he loses sleep.

Subject: General Aptitude

Max Marks: 1



- A. Ram heard of a tragedy.
- B. Ram did not hear of a tragedy.
- C. Ram lost sleep.
- D. Ram did not sleep.

A

CA

B

BD

C

DB

D

AD

Correct Option

Solution: (D)

Solution:

This is a simple if-else question. It simply means that whenever Ram hears of a tragedy, he does not sleep. As Ram heard of the tragedy, that means he did not sleep. In the other case, where it is given that Ram does not sleep, we do not know the cause, that is we cannot say for sure whether he heard of a tragedy or not.

Q.2)

Sameer's average expenditure for the first four months of the year was ₹ 251.25. For the next five months the average monthly expenditure was ₹ 26.27 more than what it was during the first four months. If the person spent ₹ 760 in all during the remaining three months of the year, find what percentage of his annual income of ₹ 3000 he saved in the year.

Subject: General Aptitude

Max Marks: 1



A

13.667%

B

-5.0866%

Correct Option

Solution: (B)

Solution:

$$\text{Total Expenditure} = 251.25 * 4 + (251.25 + 26.27) * 5 + 760 = ₹ 3152.60$$

$$\text{Required Percentage} = \frac{3000 - 3152.60}{3000} = -5.08666\%$$

C

12.333%

D

None of these

Q.3)

Despite he's considerable wealth, Mr. Premji led a simple life.

Subject: General Aptitude

Max Marks: 1



Choose the correct alternative for the underlined sentence above

A Because of his considerate

B Despite he is considerably

C In spite of his considerable

Correct Option

Solution: (C)

Solution:

Since the statement is a thought reverser, we need opposite flag word for which we have two options – despite and in spite of. Another point to be noted: “he’s” means he is whereas “his” is a possessive pronoun. Since we need a possessive pronoun here, the right answer is option C.

D No correction required

Q.4)

His position in the company was on the brink of disaster.

Subject: General Aptitude

Max Marks: 1

Choose the option which is closest in meaning to the underlined phrase in the above sentence.

A At the top of

Correct Option

Solution: (A)

Solution:

The idiom ‘On the brink of’ means: To be on the edge of/ to be on the verge of Example: She was on the brink of tears.

B At the point of

C On the side of

D On the back of

Q.5)

In the university examination last year, Survi scored 65% in English and 82% in History. What is the minimum percent she should score in Sociology, which is out of 50 marks (if English and History were for 100 marks each), if she aims at getting 78% overall?

Subject: General Aptitude

Max Marks: 1

A 94%

B 96%

Correct Option

Solution: (B)

Solution:

Survi's scores in each area is 65 and 82 respectively out of 100 each.

Since, the exam is of a total of 250 marks ($100 + 100 + 50$). So he needs 78% overall which will be $250 * \frac{78}{100} = 195$ marks. Therefore, he should score a minimum of $195 - 65 - 82 = 48$ marks in Sociology. Hence, the percentage required = $\frac{48}{50} * 100 = 96\%$

C 98%

D 92%

Q.6)

If ‘a’ is a natural number and HCF of a, a+5 is 5. If the LCM of two numbers is a three-digit number, then what is the difference between the maximum and minimum possible values of the smaller number?

Subject: General Aptitude

Max Marks: 2

A 25

B 35

C 40

D 45

Correct Option

Solution: (D)

Solution: Let $a = 5k$ then $a + 5 = 5(k + 1)$. Both $k, k + 1$ are co-prime.

LCM of $a, a + 5 = 5.k.(k + 1)$

For $k = 4, 5k(k + 1) = 100$

So minimum possible value of smaller number is 20.

Maximum value of k for which the LCM is a three-digit number is 13.

Maximum possible value of the smaller number = 65

So the required difference = $65 - 20 = 45$.

Q.7)

Subject: General Aptitude

Max Marks: 2

Let us understand the definition of metaphysics, a purely speculative science, which occupies a completely isolated position and is entirely independent of the teachings of experience. It deals with mere conceptions—not, like mathematics, with conceptions applied to intuition—and in it, the reason is the pupil of itself alone. It is the oldest of the sciences. (_____)

A

And it would struggle to survive without the architecture of mathematical support that it draws its strength from

B

Yet it continued to baffle mankind because of its abstractions

C

But it has never had and never will have the good fortune to attain to the sure scientific method

D

And it would still survive, even if all the rest were swallowed up in the abyss of an all-destroying barbarism

Correct Option

Solution: (D)

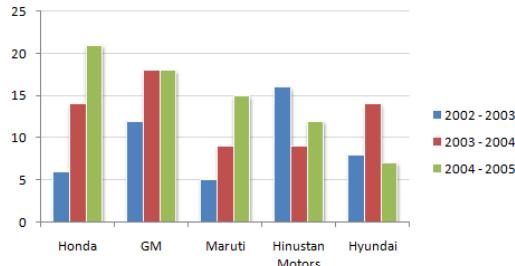
Solution:

The given question is solved on the basis of sentiment and tone. The author, in the paragraph, describes what metaphysics is and goes on to explain how it is one of the oldest sciences. In this description of metaphysics, he adopts a positive tone and it can be seen that he appreciates the field. Options A, B and C commit the mistake of being too negative in their approach and rather belittle the field of metaphysics. This makes option D the clear answer, as it is the neutral/positive statement with respect to the field of metaphysics.

Q.8)

Subject: General Aptitude

Max Marks: 2



How many companies have shown production below their average production in 2002 - 2003, but have shown above average production in 2003 - 2004 ?

A

One

B

Two

C

Three

Correct Option

Solution: (C)

Solution: Average sales of company:

$$\text{Honda} = (6 + 14 + 21)/3 = 13.66$$

$$\text{GM} = (12 + 18 + 18)/3 = 16$$

$$\text{Maruti} = (5 + 9 + 15)/3 = 9.66$$

$$\text{Hindustan Motors} = (16 + 9 + 12)/3 = 12.33$$

$$\text{Hyundai} = (8 + 14 + 7)/3 = 9.66$$

D

Four

Q.9)

Subject: General Aptitude

Max Marks: 2

A tank is fitted with 8 pipes, some of which fill the tank and others that empty the tank. Each of the pipes that fills the tank fills it in 8 hours, while each of those that empty the tank empties it in 6 hours. If all the pipes are kept open when the tank is full, it will take 6 hours to drain the tank. How many of these are fill pipes?

A

2

B

4

Correct Option

Solution: (B)

Solution:

Let the number of fill pipes be 'n'

Therefore, there will be $(8 - n)$ waste pipes.

Each of the fill pipes can fill the tank in 8 hours.

Therefore, each of the fill pipes will fill $1/8$ th of the tank in an hour.

Hence, n fill pipes will fill $n/8$ th of the tank in an hour.

Similarly, each of the waste pipes will drain the full tank in 6 hours.

Therefore, each of the waste pipes will drain $1/6$ th of the tank in an hour.

Therefore, each of the waste pipes will drain $\frac{1}{6}$ th of the tank in an hour.

Between the fill pipes and the waste pipes, they drain the tank in 6 hours.

That is, when all 8 of them are opened, $\frac{1}{6}$ th of the tank gets drained in an hour.

(Amount of water filled by fill pipes in 1 hour - Amount of water drained by waste pipes 1 hour) = $(\frac{1}{6})$ th of the tank

Therefore, $(n/8) - ((8-n)/6) = -1/6$

Note: The right hand side has a negative sign because the tank gets drained.

Cross multiplying and solving the equations, $14n - 64 = -8$

or $14n = 56$ or $n = 4$

C

6

D

5

Q.10)

12,32,72,152,(?),632

Subject: General Aptitude

Max Marks: 2



A

815

B

613

C

515

D

312

Correct Option

Solution: (D)

Solution:

$32-12=20, 72-32=40, 152-72=80$ and so on.

It means difference are doubling as 20,40,80,160,320 etc.

It otherwise means the required number will be $152+160=312$ and $312+320=632$

close