



Kunal Jha
 Course: GATE
 Computer Science Engineering(CS)

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GATE MOCK TEST 2 (GATE - 2021) - REPORTS

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Q. 1

Identify the option which will lead to correct relationship between 2 pairs of words given below:
 ???? : COIN :: PHILATELIST : STAMP

A Numismatist

Your answer is Correct

Solution :

(a)
 Numismatist is a coin collector; Naturalist is the one who studies living things and their environment; Ornithologist is the one who studies birds and Antiquarian is the one who studies old or rare books.

B Naturalist

C Ornithologist

D Antiquarian

[QUESTION ANALYTICS](#)

Q. 2
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Which of the following sentences is grammatically correct?

A If I want to perform well, I must not let anything put off my work this fortnight.

B The noise of the traffic is putting her off, so he closed the window.

C It had started to rain but this didn't put him off his game at all.

Correct Option

Solution :

(c)
 Option (c) is the only option which is grammatically correct.
 In option (a), the correct usage will require "put me off".
 In option (b), "the noise was putting her off".
 In option (d), correct usage is "put the teacher off" instead of "put off the teacher".

D The children all sat at the front and tried to put off the teacher.

[QUESTION ANALYTICS](#)

Q. 3
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In the air talent show 90 aircraft (only Sukhoi and Mig-21) participated. It is known that for every hour flight a Sukhoi and Mig-21 consumes 2 litres and 3 litres of fuel respectively. The fuel price for Sukhoi is \$ 10 per litre and price for the fuel of MIG21, is \$ 15 per litre. Thus all aircraft consumed \$ 2700 of the fuel for one hour show. The number of Sukhoi planes is

A 36

B 90

C 40

D 54

Correct Option

Solution :

(d)
 Let no. of Sukhoi be S and MIG be M.
 Given: $S + M = 90$
 Per hour expenditure in fuel for
 Sukhoi = $2 \times 10 = \$ 20$
 Per hour expenditure in fuel for
 MIG = $3 \times 15 = \$ 45$
 As per given condition,
 $\Rightarrow 20S + 45M = 2700$
 On solving equation (i) and (ii) we have,
 $S = 54$

... (i)

... (ii)

[QUESTION ANALYTICS](#)


Q. 4

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

They are 4 distinct prime numbers a, b, c, d where $a < b < c < d$. b and c are equidistant from 34, a and b are equidistant from 30, c and d are equidistant from 40, a and d are equidistant from 36. The different between a and d is

A 14

Correct Option

Solution :

(a)

$$\begin{aligned} a &< 30 < b & \dots & (i) \\ b &< 34 < c & \dots & (ii) \\ c &< 40 < d & \dots & (iii) \\ a &< 36 < d & \dots & (iv) \end{aligned}$$

From (ii) and (iii)

$$34 < c < 40$$

Only number 37 is the number which is prime between 34 to 40.

So,

$$c = 37, \quad b = 31,$$

$$a = 29, \quad d = 43$$

Now,

$$d - a = 43 - 29 = 14$$

B 30

C 21

D Can't determined

QUESTION ANALYTICS



Q. 5

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

If x and y are both positive number, then minimum value of $(x+y)\left[\frac{1}{x} + \frac{1}{y}\right]$ is _____.

4

Correct Option

Solution :

4

$$x > 0, \quad y > 0$$

$$(x+y)\left[\frac{1}{x} + \frac{1}{y}\right] = 2 + \frac{x}{y} + \frac{y}{x} = 2 + \left(k + \frac{1}{k}\right)$$

$$\text{where } k = \frac{x}{y} \text{ and } k > 0$$

Now, minimum value of $k + \frac{1}{k}$ is 2.

\therefore Minimum value of given expression = $2 + 2 = 4$

Alternate Solution :

For $x > 0, y > 0$

$$\text{AM} \geq \text{GM} \geq \text{HM}$$

$$\text{AM} = \frac{x+y}{2}$$

$$\text{HM} = \frac{2}{\frac{1}{x} + \frac{1}{y}}$$

$$\text{AM} \geq \text{HM}$$

$$\text{So, } \frac{x+y}{2} \geq \frac{2}{\frac{1}{x} + \frac{1}{y}}$$

$$(x+y)\left[\frac{1}{x} + \frac{1}{y}\right] \geq 4$$

Minimum value of given expression = 4

QUESTION ANALYTICS



Q. 6

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

The number of zeros at the end of product of $1 \times 2 \times 3 \times \dots \times 10 \times 1 \times 2 \times 3 \times \dots \times 100 \times 1 \times 2 \times 3 \times \dots \times 1000 \times 1 \times 2 \times \dots \times 10000$

A 2499

B 275

C 2774

Correct Option

Solution :

(c)

Given expression can be written as $10! \times 100! \times 1000! \times 10000!$
∴ $10!$ has $5^2 \times 2^{22}$ then it ends with 2 zeros.
Similarly,
 $100!$ Has $5^{24} \times 2^{244}$ then it ends with 24 zero.
 $1000!$ Has $5^{249} \times 2^{249}$ then it ends with 249 zero.
 $10000!$ Has $5^{2499} \times 2^{2499}$ then it ends with 2499 zero.
So, total number of zeros at the end = $2 + 24 + 249 + 2499 = 2774$

D Can't determined

QUESTION ANALYTICS



Q. 7

Solution Video

Have any Doubt?



A tariff against computers made in country Z is needed to protect computer manufacturers in this country. With such a tariff, domestic computer manufacturers would see increased sales of their own products. And increased sales frequently lead to reduced prices. The conclusion which can be most properly drawn from above statement is

A A lack of protective tariff has hampered computer production in this country.

B A tariff would probably lead to a drop in prices for buyers of domestically produced computers.

Correct Option

Solution :

(b)

C Domestic manufacturers will decrease computer production if a protective tariff is not established.

D A drop in computer prices is likely to create more jobs in the country.

QUESTION ANALYTICS



Q. 8

FAQ Solution Video

Have any Doubt?



Three friends Mukesh, Rajesh and Chetan walk from point A to B which are the two ends of the diameter of a semi circular park. Mukesh takes the shortest path along the diameter whereas Chetan takes the longest path which is along the periphery and Rajesh walks along two straight lines AC and CB where C is a point on the periphery of the semi circular park such that $AC + CB$ is maximum possible length. If all three reach B simultaneously, then what is the ratio of speeds of Mukesh, Rajesh and Chetan respectively?

A $2\sqrt{2} : 2 : \pi$

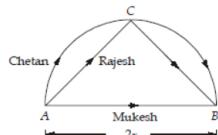
B $\sqrt{2}\pi : \pi : \sqrt{2}$

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

Correct Option

Solution :

(c)



Distance travelled by Mukesh = $2r$

Distance travelled by Rajesh = $2\sqrt{2}r$

[$AC + CB$ is maximum if $AC = CB$]

Distance travelled by Chetan = πr

Since time taken by all of them is same so ratio of their speeds.

Mukesh : Rajesh : Chetan

$$\frac{2r}{t} : \frac{2\sqrt{2}r}{t} : \frac{\pi r}{t}$$
$$2 : 2\sqrt{2} : \pi$$

D $\pi : 2\sqrt{2} : 2$

QUESTION ANALYTICS



Q. 9

Solution Video

Have any Doubt?



$f(x)$ is a polynomial function of second degree such that $f(-3) = 6$, $f(0) = 6$ and $f(2) = 11$. What is the point at which the graph of this function intersects a line drawn parallel to y axis through $x = 1$?

A $(1, -2)$

B $(1, 4)$

C (1, 6)

Correct Option

D (1, 8)

Solution :

(d)

Let, $f(x) = ax^2 + bx + c$
 $f(-3) = 9a - 3b + c = 6$
 $f(0) = c = 6$ which gives $9a = 3b$ or $b = 3a$
 $f(2) = 4a + 2b + c = 11$ which leads to $a = \frac{1}{2}$ and $b = \frac{3}{2}$

This gives $f(x) = \frac{x^2}{2} + \frac{3x}{2} + 6$. We have to find the value of $f(x)$ at $x = 1$

We can compute it as $f(1) = \frac{1}{2} + \frac{3}{2} + 6 = 8$ which leads us to get the desired point as (1, 8) i.e. (d).

QUESTION ANALYTICS

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Q. 10

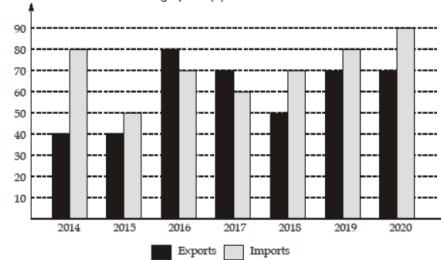
FAQ

Solution Video

Have any Doubt ?

Q

The exports and imports (in crores of ₹) of a country from 2014 to 2020 are given in the following bar chart. If the trade deficit is defined as excess of imports over exports, then which of the following option(s) is/are correct?



A Trade deficit in year 2014 is equal to the export of year 2014.

Correct Option

B Average export from year 2014 to the year 2020 is equal to ₹ 60 crores.

Correct Option

C Year 2015 and year 2019 have equal trade deficit.

Correct Option

D Average import from year 2014 to year 2020 is equal to ₹ 80 crores.

YOUR ANSWER - NA

CORRECT ANSWER - a,b,c

STATUS - SKIPPED

Solution :

(a, b, c)

(a) Trade deficit in year 2014 = $80 - 40 = 40$ crores.

Export in year 2014 = 40 crores

Export in year 2015 = 40 crores

(b) Average export = $\frac{40 + 40 + 80 + 70 + 50 + 70 + 70}{7} = 60$ crores

(c) Trade deficit in year 2015 = $50 - 40 = 10$ crores

Trade deficit in year 2019 = $80 - 70 = 10$ crores

(d) Average import = $\frac{80 + 50 + 70 + 60 + 70 + 80 + 90}{7} = 71.43$ crores

QUESTION ANALYTICS

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OVERALL ANALYSIS COMPARISON REPORT **SOLUTION REPORT**

ALL(65) CORRECT(1) INCORRECT(0) SKIPPED(64)

Q. 11

FAQ

Solution Video

Have any Doubt ?



Assume that array A and B both are sorted, each contain 'N' element. What is the worst case time complexity to find median of A U B?

A O(log N)

Correct Option

Solution :

(a) Median: Middle element in the sorted array called median.

Since both are sorted array of size N.

Time taken to combine = O(2N) = O(N) using merge procedure (outplace)

Now we get sorted array.

Find median of that array take O(1) i.e., $\frac{\text{Start index} + \text{Last index}}{2}$ = Mid

Total time = O(N) + O(1) = O(N)

or

Since both the arrays are sorted so we can apply binary search tree. To find the $\frac{N}{2}$ smallest element in the array will take log N time.

So, best answer will be O(log N).

B O(N)

C O(N log N)

D O(N²)

QUESTION ANALYTICS



Q. 12

Solution Video

Have any Doubt ?



Consider the following languages:

$L_1 = \{<M> \mid M \text{ is a TM and } L(M) \text{ is countable}\}.$

$L_2 = \{<M> \mid M \text{ is a TM and } L(M) \text{ is uncountable}\}.$

Which of the above languages is decidable?

A Only L_1

B Only L_2

C Both L_1 and L_2

Correct Option

Solution :

(c)

Every RE language is countable, so "Being countable" is trivial property of RE languages. Hence, by Rice theorem, L_1 is decidable. Property "Being uncountable" is trivial property of RE languages.

So decidable.

L_1 : "Is countable" is trivial property of RE languages (because EVERY RE language is countable). Hence, by Rice theorem, L_1 is Decidable.

L_2 : "Is uncountable" is trivial property of RE languages (because NO RE language is uncountable).

Hence, by Rice theorem, L_2 is decidable.

D None of these

QUESTION ANALYTICS



Q. 13

Solution Video

Have any Doubt ?



In a hash function $h(k) = \text{key mod } m$, where m is the size of the table. Then choose the best possible m value in 3, 7, 9, 11 and then find the number of collisions while inserting keys into hash table. Keys: 4, 12, 14, 18, 23, 44, 59, 87.

A 1

B 2

Correct Option

Solution :

(b)

Prime number is best choice but don't choose m values in terms of power of 2 because

If $m = 2^k$ then $h(\text{key}) = \text{LSB } (k) \text{ bits}$
 So here, choosing 11 is the best choice.
 $H(k) = \text{key mod } 11$

Then inserting keys into hash table:

0	44
1	12
2	23
3	14
4	4
5	59
6	
7	18
8	
9	
10	87

4 mod 11 = 4
 12 mod 11 = 1
 14 mod 11 = 3
 18 mod 11 = 7
 23 mod 11 = 1 : collision
 44 mod 11 = 0
 59 mod 11 = 4 : collision
 87 mod 11 = 10

So there are two collisions while inserting keys into hash table.

C 3

D 4

QUESTION ANALYTICS



Q. 14



Match the description of several parts of a classic optimizing compiler in list-I, with the names of those parts in list-II:
List-I

- A. A part of a compiler that is responsible for recognizing syntax.
- B. A part of a compiler that takes an input a stream of characters and produces as output a stream of words along with their associated syntactic categories.
- C. A part of a compiler that understand the meanings of variable names and other symbols and checks that they are used in ways consistent with their definitions.
- D. An IR-to-IR transformer that tries to improve the IR program in some way (Intermediate Representation).

List-II

- (i) Optimizer
- (ii) Semantic analysis
- (iii) Parser
- (iv) Scanner

Codes:

- | A | B | C | D |
|-----|-------|------|-------|
| (a) | (iii) | (iv) | (i) |
| (b) | (iii) | (iv) | (ii) |
| (c) | (ii) | (iv) | (i) |
| (d) | (ii) | (iv) | (iii) |

A a

B b

Correct Option

Solution :

(b)
 Parser is a part of compiler and responsible for syntax recognition. Scanner (or tokenization) used by the lexical analyzer. In Semantic analysis consistency and definition of syntax is checked. An optimizer is used to improve the IR program. So option (b) is correct.

C c

D d

QUESTION ANALYTICS



Q. 15



Which of the following option denotes the difference and borrow of a half subtractor performing the operation $X - Y$? (\oplus represents Ex-OR operation, \ominus represents the Ex-NOR operation)

A Difference = $X \oplus Y$, Borrow = XY

B Difference = $X \oplus Y$, Borrow = XY

C Difference = $X \oplus Y$, Borrow = $X'Y$

Correct Option

Solution :

(c)

Truth table of half subtractor is,

Inputs		Outputs	
X	Y	D	B
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

$$D = X \oplus Y \text{ and } B = X'Y$$

Hence answer is option (c).

D Difference = $X \ominus Y$, Borrow = XY

QUESTION ANALYTICS



Q. 16

Solution Video

Have any Doubt ?



Consider the relation $R(A, B, C, D, E)$ with the following FD's

$CD \rightarrow E$

$E \rightarrow A$

$B \rightarrow D$

$A \rightarrow BC$

If the relation R is decomposed into two relation $R_1(ABC)$ and $R_2(ADE)$, then which of the following statements is correct about its decomposition.

A Lossless join

Correct Option

B Lossy join

C Not dependency preserving decomposition

Correct Option

D Dependency preserving decomposition

YOUR ANSWER - NA

CORRECT ANSWER - a,c

STATUS - SKIPPED

Solution :

(a, c)

In both the relations R_1 and R_2 , A is the common attribute and is the primary key of relation $R_1(A \rightarrow BC)$. Hence, it is a lossless join. But the dependencies are not preserved.

QUESTION ANALYTICS



Q. 17

FAQ Solution Video

Have any Doubt ?



For what purpose preamble is used in the ethernet frame format 802.3?

A To indicate the starting of the frame to the receiver.

B For providing ICMP error control in the frame.

C To synchronize the receiver clocks of the devices in network.

Correct Option

D All of above

YOUR ANSWER - NA

CORRECT ANSWER - c

STATUS - SKIPPED

Solution :

(c)

The preamble consists of a 56-bit (seven-byte) pattern of alternating 1 and 0 bits, allowing devices on the network to easily synchronize their receiver clocks, providing bit-level synchronization. It is followed by the SFD to provide byte-level synchronization and to mark a new incoming frame.

QUESTION ANALYTICS



Q. 18

FAQ Solution Video

Have any Doubt ?



Frames of 1000 bits are sent over a 1 Mbps channel using a geostationary satellite whose propagation time from the earth is 270 msec. The headers are very short. Three bit sequence numbers are used. What is the maximum achievable channel utilization for stop and wait protocol. [Correct upto two places of decimals]

0.18

Correct Option

Solution :

0.18

In stop and wait only one frame is transmitted in round trip time.

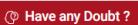
$$\text{Transmission time} = \frac{\text{Data size}}{\text{BW}} = \frac{1000 \text{ bits}}{1 \text{ Mbps}} = 1 \text{ msec}$$

$$\begin{aligned}
 P_t &= 270 \text{ msec} \\
 W_s &= 1 \text{ (stop and wait)} \\
 A &= \frac{t_p}{t_t} = \frac{270 \text{ msec}}{1 \text{ msec}} = 270 \\
 \text{Efficiency} &= \frac{W_s}{1+2a} \\
 &= \frac{1}{(1+2\times270)} \Rightarrow \frac{1}{541} = 0.18\%
 \end{aligned}$$

 QUESTION ANALYTICS



Q. 19

? FAQ 



What will be the output of program if you run this code on 64 bit machine.

```
#include <stdio.h>
#include <string.h>
int main()
{
    printf("%u %u %u %u", sizeof(NULL), sizeof(""), strlen(""), sizeof('\0'));
    return 0;
}
```

A 8, 1, 1, 1

Correct Option

Solution :

(a)

Since NULL is defined as ((void*)0), we can think of NULL as special pointer and its size would equal to any pointer. If the pointer size of a platform is 4 bytes the output of the above program would be 4 but if pointer size on platform is 8 bytes, the output of above program would be 8, as we are considering 64 bit machine and is " " One byte because that empty string has a EOL character.

B 4, 1, 1, 1

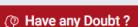
C 8, 0, 0, 1

D 4, 0, 0, 1

 QUESTION ANALYTICS



Q. 20

 Solution Video 



Consider a relation S = (A, B, C, D). For which of the following sets of FD's in S is not in 3rd normal form?

A {ABC → D, ACD → B, A → D, BCD → A}

B {AD → C, BC → A, BD → C, CD → B}

C {AC → D, D → A, D → B, D → C}

D {AC → E, A → D, C → A, D → B}

Correct Option

Solution :

(d)

For (i): For FD A → D, the LHS is not the super key but RHS is a prime attribute. Therefore, it is in 3NF.

For (ii): The candidate keys are AD, BD and CD. Thus, for FD BC → A, the LHS is not the superkey but RHS is a prime attribute. Therefore, it is in 3NF.

For (iii), The candidate keys are AC and D. Thus, all the FD's satisfy the 3NF condition and thus it is in 3NF.

For (iv), the candidate key is C, therefore, FD AC → E, A → D, D → B neither LHS is the super key nor RHS is having the prime attribute, therefore, it is not in 3NF.

 QUESTION ANALYTICS





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OVERALL ANALYSIS COMPARISON REPORT **SOLUTION REPORT**

ALL(65) CORRECT(1) INCORRECT(0) SKIPPED(64)

Q. 21

Solution Video Have any Doubt ?

Find the exact value of $\lim_{x \rightarrow 0} \frac{\sqrt{3+x} - \sqrt{3}}{x}$

A $\sqrt{3}$

B 0

C $\frac{1}{2\sqrt{3}}$

Correct Option

Solution :

(c)

Apply L'Hospital rule,

$$\lim_{x \rightarrow 0} \frac{\sqrt{3+x} - \sqrt{3}}{x} = \frac{1}{2\sqrt{3}}$$

D The limit does not exist

QUESTION ANALYTICS

Q. 22

Solution Video Have any Doubt ?

What is the maximum number of nodes in B+ tree possible with order 4 and height 5 is _____.

1365

Correct Option

Solution :

1365

B+ tree with order 4 means that at maximum we can have 4 block pointer in a node while minimum is 2. For getting maximum number of node, we need to utilize maximum possible block pointer as a node in the next levels. So the tree will be like:

Level	Maximum nodes	Maximum block pointers
0	1//root node	4
1	4	$4 \times 4 = 16$
2	16	$16 \times 4 = 64$
3	64	$64 \times 4 = 256$
4	256	$256 \times 4 = 1024$
5	1024	$1024 \times 4 = 4096$
Total nodes	1365	

The height of the node is the number of edges on the longest path from the node to a leaf. So we have taken upto 5th level, so this way root to leaf, number of edges will be 5 and maximum number of nodes will be 1365.

QUESTION ANALYTICS

Q. 23

FAQ Solution Video Have any Doubt ?

Consider the following FD's of schema R(A, B, C, D, E, F, G):

$AD \rightarrow B$

$B \rightarrow C$

$CD \rightarrow E$

$E \rightarrow F$

$F \rightarrow G$

The relation R(A, B, C, D, E) is in

A In 2NF but not in 3NF

Correct Option

Solution :

(a)

The relation R consists of FD's: $B \rightarrow C$ and $CD \rightarrow E$. These all are transitive dependencies therefore, it is not in 3NF. But there is no partial dependency, therefore, it is in 2NF. Hence the correct option is (a).

QUESTION ANALYTICS

QUESTION ANALYTICS

C In BCNF

D None of above

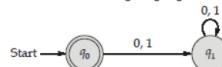
QUESTION ANALYTICS

Q. 24

Solution Video

Have any Doubt?

Which of the following language is accepted the given DFA?



A \emptyset

B $\Sigma^* - \{x \mid x \in \Sigma^* \text{ and } |x| > 0\}$

Correct Option

Solution :

(b) The DFA accepts the empty string.

Option (b) is the correct as we are eliminating all the strings of length > 0 the universal language Σ^* .

$\Sigma^* - \{x \mid x \in \Sigma^* \text{ and } |x| > 0\} = \epsilon$

C $\Sigma^* - \{0, 1\}$

D $\{0, 1\}$

QUESTION ANALYTICS

Q. 25

FAQ

Solution Video

Have any Doubt?

Which of the following is not true about the IPv4 header?

A 40 bytes of minimum header is allowed in the IPv4.

Correct Option

B HLEN bits is used to calculate the size of packet.

Correct Option

C DF bits tells us about the intermediate or last fragment.

Correct Option

D VERSION bits tells us about which version we are using in the network layer.

YOUR ANSWER - NA

CORRECT ANSWER - a,b,c

STATUS - SKIPPED

Solution :

(a, b, c)

1. 20 bytes of minimum header is possible.
2. HLEN bits are used to calculate the header length.
3. DF bits tell whether the data is fragment or a packet.
4. It tells whether we are using version IPv4 or IPv6.

QUESTION ANALYTICS

Q. 26

Have any Doubt?

Assume that main() calls the following function test() exactly once
void test(void)

```

{
    if(fork() == 0)
    {
        printf("GATE");
        exit(0);
    }
    printf("2021");
}
  
```

What will be the possible output?

A GATE 2021

Correct Option

B 2021 GATE

Correct Option

C GATE 2021 2021

D None of these

YOUR ANSWER - NA

CORRECT ANSWER - a,b

STATUS - SKIPPED

Solution :

(a,b)

fork() returns 0 to the child process and some +ve value to the parent process. So gate will be printed by the child and [2021] will be printed by the parent. Now order of execution cannot be determined. Any of them can execute at first. So option (a) and (b) both are possible.
 If we don't write exit (0) in the if statement then both the child and parent will print the [2021]
 so this exit(0) statement makes the child to not print the [2021].

QUESTION ANALYTICS



Q. 27

▶ Solution Video

⌚ Have any Doubt ?



Consider the following grammar:

 $S \rightarrow AbA$ $A \rightarrow Aa | \epsilon$

The Chomsky Normal Form for the given grammar is

A $S \rightarrow TA | BA | AE | b$
 $A \rightarrow AA | a$
 $T \rightarrow AB$
 $B \rightarrow b$

B $T \rightarrow AB$
 $B \rightarrow b$
 $S \rightarrow TA | BA | AB$
 $A \rightarrow AC | a$
 $T \rightarrow AB$
 $B \rightarrow b$
 $C \rightarrow a$

C $S \rightarrow TA | BA | AB | b$
 $A \rightarrow AC | a$
 $T \rightarrow AB$
 $B \rightarrow b$
 $C \rightarrow a$

Correct Option

Solution :

(c)

CNF: Every production is of the form
 $A \rightarrow BC | a$

Where A, B, C are variables and a is the terminal

Given grammar is

 $S \rightarrow AbA$
 $A \rightarrow Aa | \epsilon$
Eliminate ϵ productions from the grammar
 $S \rightarrow AbA | Ab | bA | b$
 $A \rightarrow Aa | a$

Convert it to CNF

 $S \rightarrow ABA | AB | BA | b$
 $A \rightarrow Aa | a$
 $B \rightarrow b$

Now,

 $S \rightarrow TA | AB | BA | b$
 $T \rightarrow AB$
 $A \rightarrow Aa | a$
 $B \rightarrow b$

Hence CNF form is

 $S \rightarrow TA | AB | BA | b$
 $T \rightarrow AB$
 $A \rightarrow AC | a$
 $B \rightarrow b$
 $C \rightarrow a$
D None of these

QUESTION ANALYTICS



Q. 28

? FAQ

▶ Solution Video

⌚ Have any Doubt ?



You have found empirically that the implemented insertion sort spent on an average $5 \mu s$ to sort an array of 1000 elements. If algorithm will spend for sorting an array of 1000,000,000 elements is t_1 time then the value of $\lfloor \log_{10} t_1 \rfloor = \underline{\hspace{2cm}}$. Where $\lfloor \cdot \rfloor$ represents the floor function.

12

Correct Option

Solution :

12

The time complexity of insertion sort $O(n^2)$ the average time taken is

$$\begin{aligned} k \times n^2 &= 5 \mu s \\ k \times (10^9)^2 &= 5 \\ k &= 5 \times 10^{-6} \end{aligned}$$

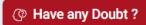
For sorting 1, 000, 000, 000 elements it would require

$$\begin{aligned}
 t_1 &= k \times n^2 \\
 &= (5 \times 10^{-6}) \times (10^9)^2 = 5 \times 10^{12} \mu\text{s} \\
 &= \lfloor \log_{10} (5 \times 10^{12}) \rfloor = \lfloor 12 + \log_{10} 5 \rfloor = 12
 \end{aligned}$$

 QUESTION ANALYTICS



Q. 29





What are the minimum number of nodes in an AVL tree of depth 9 if we are considering root at depth 1.

88

Correct Option

Solution :

88

Here, we are just making confusion by writing depth and starting root at level 1, so here total height of AVL tree will be 8 so we need to calculate nodes for this height. We can use formula for that as we know that min nodes for height 5 and height 6 are 20 and 33.

1. If $h = 0$: level 1 : $h(0) \Rightarrow 1$ node
2. If $h = 1$: level 2 : $h(1) \Rightarrow 2$ nodes

Minimum number of nodes (h) = Minimum number of nodes ($h - 1$) + Minimum number of nodes ($h - 2$) + 1

level 3: $h(2) \Rightarrow 4$ nodes

level 4: $h(3) \Rightarrow 7$ nodes

level 5: $h(4) \Rightarrow 12$ nodes

level 6: $h(5) \Rightarrow 20$ nodes

$h(7) = h(6) + h(5) + 1 = 33 + 20 + 1 = 54$

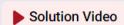
$h(8) = h(7) + h(6) + 1 = 54 + 33 + 1 = 88$

So, min nodes for depth 9, AVL tree while considering root at depth 1 instead of 0 so here at $h = 8$ it is calculated and min nodes will be 88.

 QUESTION ANALYTICS



Q. 30







Which of the following languages are CFL:

A = $\{ww^R \# ww^R \mid w \in \{0 + 1\}^*\}$ where w^R is the reverse of R.

B = $\{a^i b^j c^k \mid i = j \text{ or } j = k, i, j, k \geq 1\}$.

A only

B only

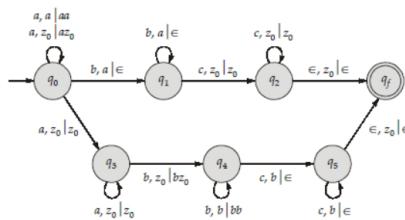
Correct Option

Solution :

(b)

- B = $\{a^i b^j c^k \mid i = j \text{ or } j = k\}$

We can construct a PDA that will accept either $i = j$ or $j = k$



- A = $\{ww^R \# ww^R \mid w \in \{0 + 1\}^*\}$ where w^R is the reverse of R

We need two stacks:

First stack used for checking the equality between w and w^R .

Second stack used for checking the equality ww^R and ww^R .

The language A requires more than one stack, hence it is not CFL.

C Both A and B

D None of these

 QUESTION ANALYTICS





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OVERALL ANALYSIS COMPARISON REPORT **SOLUTION REPORT**

ALL(65) CORRECT(1) INCORRECT(0) SKIPPED(64)

Q. 31

? FAQ ▶ Solution Video ⚡ Have any Doubt ?



Consider a classful addressing with a network address of 172.15.0.0/19 provides how many subnets possible (including zero subnets and DBA subnet)and hosts?

A 7 subnets, 30 hosts each

B 8 subnets, 8,190 hosts each

Correct Option

Solution :

(b)
 This address belongs to class B.
 The class B address mask is 16.
 The subnet bits = 19 - 16 = 3
 Total subnet number = 8
 The total host in each subnet= $2^{13} - 2 = 8190$

C 8 subnets, 2,046 hosts each

D 6 subnets, 2,046 hosts each

QUESTION ANALYTICS



Q. 32

▶ Solution Video ⚡ Have any Doubt ?



Let $f(x) = \frac{5}{2}x^2 - e^x$. Find the value of x for which the second derivative $f''(x)$ equal zero.

A $\ln 5$

Correct Option

Solution :

(a)
 $f'(x) = 5x - e^x$
 $f''(x) = 5 - e^x$
 $f''(x) = 0$
 iff
 $5 - e^x = 0$
 $e^x = 5$
 $x = \ln 5$

B $5e$

C 0

D e^5

QUESTION ANALYTICS



Q. 33

▶ Solution Video ⚡ Have any Doubt ?



The instructions based on the stack operations are also known as 'zero address' or 'implied instructions', because _____.

A Address gets updated automatically in stack pointer.

Correct Option

B Processor can refer a memory stack without specifying the address.

Correct Option

C Both (a) and (b)

Correct Option

D None of above

YOUR ANSWER - NA

CORRECT ANSWER - a,b,c

STATUS - SKIPPED

Solution :

(a,b,c)

Implied Addressing mode: The implied addressing mode, also called the implicit addressing mode (X86 assembly language), does not explicitly specify an effective address for either the source or the destination (or sometimes both). Either the source (if any) or destination effective address (or sometimes both) is implied by the opcode.

Address gets updated automatically in stack pointer : True
 Processor can refer a memory stack without specifying the address : True

QUESTION ANALYTICS



Q. 34

Solution Video

Have any Doubt ?



Let G be a simple graph with n vertices and k connected components. The minimum possible number of edges of G is

A $n - 1$

B $n - k$

Correct Option

Solution :

(b)

Let each component i have c_i vertices. If we put a minimum spanning tree to keep it connected, we get $c_i - 1$ edges. So the total number of edges is

$$\sum_{i=1}^k (c_i - 1) = \sum_{i=1}^k c_i - k = n - k$$

Thus it does not matter how the components are selected, we always get this minimum.

C $n - k + 1$

D $k - n + 1$

QUESTION ANALYTICS



Q. 35

? FAQ

Solution Video

Have any Doubt ?



Suppose that in 1000 memory references there are 40 misses in L_1 cache and 10 misses in L_2 cache. If the miss penalty of L_2 is 200 clock cycles, hit time of L_1 is 1 clock cycle, and hit time of L_2 is 15 clock cycles, the average memory access time will be _____ clock cycles. Assume that cache follows the global miss rate. (Upto 2 decimal places)

B $1.68 (1.65 - 1.70)$

Correct Option

Solution :

1.68 (1.65 - 1.70)

$$\begin{aligned} \text{AMAT} &= 1 + 0.04 \times (15 + 0.01 \times 200) \\ &= 1 + 0.04 \times (17) \\ &= 1 + 0.68 = 1.68 \end{aligned}$$

QUESTION ANALYTICS



Q. 36

Solution Video

Have any Doubt ?



A XY flip-flop has four operations: Clear to 0 (00), No change (01), Complement (10) Set to 1 (11) when the inputs X and Y are 00, 01, 10 and 11 respectively. Which of the following represents the characteristics equation of this XY flip-flop? (Q_n represents present state and Q_{n+1} represents the next state)

A $Q_{n+1} = X' Q_n' + Y Q_n$

B $Q_{n+1} = X Q_n' + Y' Q_n$

C $Q_{n+1} = X Q_n' + Y Q_n'$

D $Q_{n+1} = X Q_n' + Y Q_n$

Correct Option

Solution :

(d)

The truth table of XY flip-flop is,

X	Y	Q_{n+1}
0	0	0
0	1	Q_n
1	0	\bar{Q}_n
1	1	1

The characteristics table of XY

X	Y	Q_n	Q_{n+1}
0	0	0	0
0	1	1	0
1	0	0	1
1	1	1	1

1	1	1	1
---	---	---	---

Therefore, the characteristics equation is $Q_{n+1} = X Q_n' + Y Q_n$
Hence, option (d) is the answer.

QUESTION ANALYTICS

Q. 37

FAQ Solution Video

Have any Doubt?



Consider the following statements: Which of the below statements are true?

A Race condition in positive edge triggered JK F-F occurs when J = 1 and K = 1.

B Master slave FF doesn't suffer from race condition.

Correct Option

C The excess-3 BCD code for 597 is given by 100011001010.

Correct Option

D Invalid input combinations a BCD adder will receive are 156.

Correct Option

YOUR ANSWER - NA

CORRECT ANSWER - b,c,d

STATUS - SKIPPED

Solution :

(b, c, d)

(a) Because in JK F-F race condition occurs only in level triggered and Master slaves overcomes the problem of race condition.

(c) The addition of '3' to each digit yields the three new digits '8', '12' and '10'. Hence, the corresponding four-bit binary equivalents are 100011001010, in accordance to 8421 format.

(d) Valid BCD codes = 10 out of 16

BCD adder takes two numbers.

So total combinations possible = $16 \times 16 = 256$

Out of that valid combinations = $10 \times 10 = 100$ only

So invalid input combinations = $256 - 100 = 156$

QUESTION ANALYTICS

Q. 38

Solution Video

Have any Doubt?



For an n -stage pipeline implementation of some computation, the maximum speedup that can be obtained is upper bounded by:

A 2^n

B n

Correct Option

Solution :

(b)

The maximum speedup that can be obtained in a pipeline is upper bounded by the number of stages.

C 2^n

D None of above

QUESTION ANALYTICS

Q. 39

Solution Video

Have any Doubt?



Consider the function $f(x) = x + \ln x$ and f is differentiable on $(1, e)$ and $f(x)$ is continuous on $[1, e]$. Determine the c value using mean value theorem.[By computing $f'(c) = \frac{f(b)-f(a)}{b-a}$]

A e

B $e - 1$

Correct Option

Solution :

(b)

$$f(x) = x + \ln x$$

$$f'(x) = 1 + \frac{1}{x}$$

$$f'(c) = \frac{f(b)-f(a)}{b-a} = \frac{f(e)-f(1)}{e-1} \quad \dots(1)$$

$$= \frac{e + \ln e - (1 + \ln 1)}{e-1} = \frac{e+1-1+0}{e-1} = \frac{e}{e-1}$$

$$\therefore c = \frac{e}{e-1}$$

$$\begin{aligned}
 \Rightarrow f'(c) &= \frac{e}{e-1} \text{ [from equation (1)]} \\
 \Rightarrow 1 + \frac{1}{c} &= \frac{e}{e-1} \\
 \Rightarrow \frac{1}{c} &= \frac{e}{e-1} - 1 \\
 \Rightarrow \frac{1}{c} &= \frac{e-e+1}{e-1} \\
 \Rightarrow c &= e-1
 \end{aligned}$$

C $\frac{e}{e-1}$

D $\frac{e-1}{e}$

QUESTION ANALYTICS



Q. 40

FAQ

Solution Video

Have any Doubt ?



Let f and g be defined by $f(x) = \sqrt{x}$ and $g(x) = x - 1$. Then which of the following are true.

- I. $f(g(x))$ is continuous on $[0, \infty)$
- II. $g(f(x))$ is continuous on $[0, \infty)$
- III. $f(g(x))$ is continuous on $[1, \infty)$

A I only

B II only

Correct Option

C III only

Correct Option

D None of these

YOUR ANSWER - NA

CORRECT ANSWER - b,c

STATUS - SKIPPED

Solution :

(b, c)

$f(g(x)) = \sqrt{(x-1)}$ is defined only for $x \geq 1$ therefore statement I is false.

Statement III is correct as the f is defined in $[1, \infty)$ and it is a polynomial in x , therefore, it is continuous in the given range.

$g(f(x)) = (\sqrt{x}) - 1$ it is defined for $x \geq 0$ i.e. in the range $[0, \infty)$ and it is also continuous in the given range. Statement III is true.

QUESTION ANALYTICS





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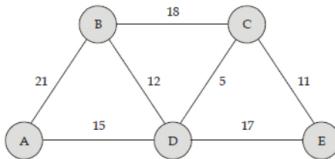
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Q. 41
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An administrator wants to run the distance vector routing protocol for routing in the servers. The picture is showing the respective costs between the servers.



Initial routing table is A

Nodes	Distance
A	0
B	21
C	infinity
D	15
E	infinity

The distance vector shared by the B to A is [21, 0, 18, 12, infi].

The distance vector shared by D to A is [15, 12, 5, 0, 17]

What is the final table for A after receiving the DV from B and D?

Answer will be the addition of the final distances of A table?

88
[Correct Option](#)
Solution :
88

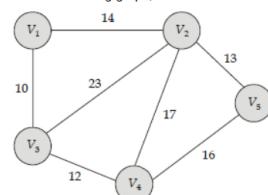
The final table of A is

$$\begin{aligned} A \text{ to } A &= 0 \\ A \text{ to } B &= \min [21 \text{ directly}, 15 + 12 \text{ (using D)}] = 21 \\ A \text{ to } C &= \min [21 + 18 \text{ (using B)}, 15 + 5 \text{ (using D)}] = 20 \\ A \text{ to } D &= \min [(15 \text{ directly}), 21 + 12 \text{ (using B)}] = 15 \\ A \text{ to } E &= \min [(21 + \text{infi}(using B)) + (15 + 17 \text{ (using D)})] = 32 \end{aligned}$$

QUESTION ANALYTICS


Q. 42
[Solution Video](#)
[Have any Doubt ?](#)


Given the following graph, what is the cost of the minimal spanning tree of the graph is _____.


49
[Correct Option](#)
Solution :
49

Applying Kruskal's algorithm sort the edges in ascending order

 $V_1 - V_3, V_3 - V_4, V_2 - V_5, V_1 - V_2, V_4 - V_5, V_4 - V_2, V_2 - V_3$

We get,

 First, add $V_1 - V_3$

 Then add $V_3 - V_4$

 Then $V_2 - V_5$

 Then $V_1 - V_2$

All the vertices are covered we can stop.

$$\text{Cost} = 10 + 12 + 13 + 14 = 49$$

QUESTION ANALYTICS


Q. 43
[FAQ](#)
[Solution Video](#)
[Have any Doubt ?](#)


Which of the following of the following languages are CFLs

- I. $\{a^m b^n c^p d^q : m + n = p + q\}$
- II. $\{a^m b^n c^p d^q : m \geq n \geq p \geq q\}$

- II. $\{w \in \{a, b\}^*: w \text{ has twice as many } a's \text{ as } b's\}$
III. $\{uawb : u, w \in \{a, b\}^* \mid |u| = |w|\}$

A I and II only

B II and III only

C I and III

D I, II and III

Correct Option

Correct Option

YOUR ANSWER - NA

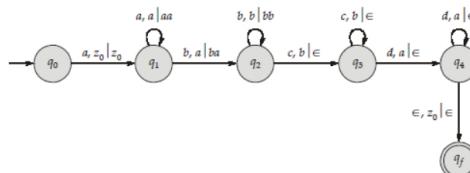
CORRECT ANSWER - C,D

STATUS - SKIPPED

Solution :

(c, d)

I. $\{a^m b^n c^p d^q : m + n = p + q\}$ is CFL.



II. $\{w \in \{a, b\}^* : w \text{ has twice as many } b's \text{ as } a's\}$ is CFL.

The grammar that generates the given language

$G = (\{S\}, \{a, b\}, P, S)$, where

$P = [S \rightarrow SaSbSbS, S \rightarrow SbSaSbS, S \rightarrow SbSbSaS, S \rightarrow ε]$

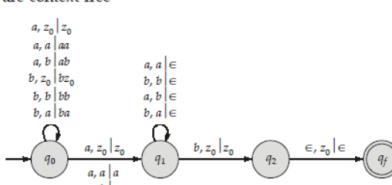
For all a's we will apply push operation and for every b we will apply one skip and one pop operation.

III. $\{uawb : u, w \in \{a, b\}^* \mid |u| = |w|\}$

We can send all symbols of u on the stack and apply skip operation on a then for every symbol on w will apply skip operation on a then for every symbol on w will apply pop operation on the stack.

Finally skip b to reach the final.

All of them are context free



Hence option (c) and (d) are correct.

QUESTION ANALYTICS



Q. 44

Have any Doubt ?



Consider a UNIX file system with 10 direct pointers, 1 indirect pointer, 1 double-indirect pointer, and 1 triple-indirect pointer in the i-node. Assume that disk blocks are 4 Kbytes and that each pointer to a disk block requires 4 bytes. What is the largest possible file that can be supported with this design approximately in terms of TB (Terabytes) _____ [Nearest integer values]

4

Correct Option

Solution :

4

Each direct pointer to 4 KB of data, for a total of 10×4 KB.

The indirect pointer points to an indirect block that contains pointers to data. The indirect block is a 4 KB block filled with 4 byte pointers, for a total of 1024 pointers. Thus, the indirect pointer can refer to 1024×4 KB of data.

Similarly, the double indirect pointer points a double indirect block containing 1024 pointers to indirect blocks, each of which points to 4 KB \times 1024 for a total of $1024 \times 1024 \times 4$ KB of data.

Finally, the triple indirect pointer refers to $1024 \times 1024 \times 1024 \times 4$ KB.

The total data is thus 10×4 KB + 1024×4 KB + $1024 \times 1024 \times 4$ KB + $1024 \times 1024 \times 1024 \times 4$ KB.
 40 KB + 4 MB + 4 GB + 4 TB = 4.004 TB (Approximately)

QUESTION ANALYTICS



Q. 45

Solution Video

Have any Doubt ?



An array of elements is given as 10, 15, 30, 40, 50, 100, 20. Then construct min-heap and max-heap of the given elements. Find out how many elements are still at the same node in both the heaps. Please note: heapify is being applied after inserting all the elements while constructing min/max heap (complete binary tree)

A 2

Correct Option

B 1

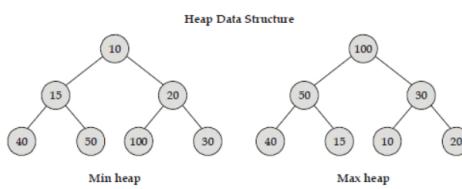
Solution :

(b)

Heap: A Heap is a data structure in which the tree is a complete binary tree. Generally, Heaps can be of two types:

Max-Heap: In a Max-Heap the key present at the root node must be greatest among the keys present at all of its children. The same property must be recursively true for all sub-trees in that binary tree.

Min-Heap: In a Min-Heap the key present at the root node must be minimum among the keys present at all of its children. The same property must be recursively true for all sub-trees in that binary tree.



There is only one element 40, which is at the same position in both the heaps so answer will be 1.

C 4

D 3

QUESTION ANALYTICS



Q. 46

FAQ Solution Video

Have any Doubt?



For which of the following matrices LU decomposition does not exist.

A
$$\begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

B
$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 1 & 3 & 4 \end{bmatrix}$$

Correct Option

Solution:

(b)

To check if LU decomposition exists we need to check for the determinant of the leading principal minors of the matrix should not be zero.

Option (a): All $|A_1| \neq 0$
 $|A_2| \neq 0$
 $|A_3| \neq 0$

Option (b): $|A_1| \neq 0$
 $|A_2| \neq 0$

Therefore the LU decomposition does not exist for this matrix.

C
$$\begin{bmatrix} 1 & 7 & 9 \\ 7 & 10 & 12 \\ 22 & 1 & 3 \end{bmatrix}$$

D None of these

QUESTION ANALYTICS



Q. 47

FAQ Solution Video

Have any Doubt?



A link has a bit error rate of 10^{-9} . If bit errors are independent of each other, what is the probability that 1 million bit file will be transferred over the link without error?

A $0.3679 = e^{-1}$

B 0.5

C 0.999

Correct Option

Solution:

(c)

Probability of having error = Bit error rate

$$= \frac{1}{10^9} = 1 \text{ bit error can take place in } 10^9 \text{ bits.}$$

For, 1 million bits = 0.001 probability of having error

$$\text{Probability of not having error} = \frac{1000000}{10^9} = 1 - 0.001 = 0.999$$

D <0.001

QUESTION ANALYTICS



Given 4 matrices M_1, M_2, M_3, M_4 , which are having the orders of the following form $2 \times 3, 3 \times 4, 4 \times 7, 7 \times 2$, this matrix multiplication was done by using the optimal parenthesization then the number of multiplication operations done are _____.

92

Correct Option

Solution :

92

The recurrence relation for getting the minimum number of matrix multiplication is

$$M[i, j] = \begin{cases} 0 & \text{if } i = j \\ \min_{1 \leq k < j} \{M[i, j] = M[i, k] + M[k, j] + p_{i-1} p_k p_j\} \end{cases}$$

$$M[1, 1] = 0$$

$$M[2, 2] = 0$$

$$M[3, 3] = 0$$

$$M[4, 4] = 0$$

$$M[1, 2] = 2 \times 3 \times 4 = 24$$

$$M[2, 3] = 3 \times 4 \times 7 = 84$$

$$M[3, 4] = 4 \times 7 \times 2 = 56$$

$$M[1, 2] = \min((M[1, 1] + M[2, 3] + (2 \times 3 \times 7)), (M[1, 2] + M[2, 2] + (2 \times 4 \times 7))) = \min(84 + 42, 80) = 80$$

$$M[2, 4] = \min((M[2, 2] + M[3, 4] + (3 \times 4 \times 2)), (M[2, 3] + M[4, 4] + (3 \times 7 \times 2))) = \min(80, 84 + 42) = 80$$

$$M[1, 4] = \min((M[1, 1] + M[2, 4] + (2 \times 3 \times 2)), (M[1, 2] + M[3, 4] + (2 \times 4 \times 2)), (M[1, 3] + M[4, 4] + (2 \times 7 \times 2))) = \min(80 + 12, 24 + 56 + 16, 80 + 28) = 92$$

 QUESTION ANALYTICS

+

What is the maximum number of nodes in B+ tree possible with order 3 and height 3 is _____.

40

Correct Option

Solution :

40

B^* tree with order 3 means that at maximum we can have 3 block pointers in a node while the minimum is 2. For getting the maximum number of nodes, we need to utilize the maximum possible block pointer as a node in next levels. So the tree will be like:

Level	Maximum nodes	Maximum block pointers
0	1 // root node	3
1	3	$3 \times 3 = 9$
2	9	$9 \times 3 = 27$
3	27	$27 \times 3 = 81$
Total nodes	40	

The height of the node is the number of edges on the longest path from the node to a leaf. So we have taken upto 4th level, so this way root to leaf, number of edges will be 4 and maximum number of nodes will be 40.

 QUESTION ANALYTICS

+

Consider the below given schedule S having three transactions T_1, T_2 and T_3 working on data items x, y , and z . Here, $R(D)$ and $W(D)$ denote read and write operation of data item D respectively.

T_1	T_2	T_3
	$R(y)$	
$R(x)$		
		$R(y)$
		$R(z)$
$W(z)$		
	$W(y)$	
	$W(x)$	

Which of the following ordering of time stamps is allowed to execute the schedule using basic time stamp protocol?

A $(T_1, T_2, T_3) = (100, 200, 300)$

B $(T_1, T_2, T_3) = (100, 300, 200)$

C $(T_1, T_2, T_3) = (300, 200, 100)$

D $(T_1, T_2, T_3) = (200, 300, 100)$

Correct Option

Solution :

(d)

Let us consider each data item separately:

On considering data item x : data item x is read by T_1 and finally written by transaction T_2 , therefore, $T_2 > T_1$.

On considering data item y : data item y is read by T_3 and finally written by transaction T_2 , therefore, $T_2 > T_3$.

On considering data item z : data item z is first read by T_3 and finally written by T_1 , therefore, $T_1 > T_3$.

From the above analysis we can say that time stamp of $T_3 < T_1 < T_2$. Thus, the only option which satisfies this sequence is (iv).

QUESTION ANALYTICS

+

Item 41-50 of 65 « previous 1 2 3 4 5 6 7 next »



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GATE MOCK TEST 2 (GATE - 2021) - REPORTS

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Q. 51
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Time complexity of the below fragment of code is given by

```
for(i = 0; i < n; i++)
{
    if(i% 2 == 0)
    {
        for(j = i; j < n; j++)
        {
            if(i% 2 == 0 && j% 2 == 0)
                printf("GATE 2020");
        }
    }
}
```

 A $O(n^{5/2})$
 B $O(\log n)$
 C $O(n \log n)$
 D $O(n^2 \log n)$

Correct Option

Solution :

(d)

 The outer loop is executed n times.

 The inner loop is executed $\frac{n}{2}$ times with i is even, inside the inner loop we have statements of

 constant time and it gets executed n times when $i = 0$, when $i = 2$ then it gets executed $n - 2$ times and so on when $i = n$ the inner loop gets executed 0 times, total number of times $0 + 2 + 4 + \dots + n$ times.

$$= (n - 1) \times \frac{n}{2} = O(n^2)$$
 the most appropriate or tightest upper bound is $O(n^2 \log n)$ among the options as it is the most slowest growing among $n^{5/2}$ and $n^2 \log n$.


Q. 52
[FAQ](#)
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Consider the segment table: Find the physical address for the following logical address <1, 219>

Segment	Base	Length
0	1000	110
1	1800	90
2	2000	900
3	3200	68
4	4300	980

 A 2019

 B 319

 C 1119

 D None of these

Correct Option

Solution :

(d)

It's an illegal address since the size of the segment 1 is 90 and its logical address is referring 219.


Q. 53
[FAQ](#)
[Have any Doubt ?](#)


Consider the following statements:

- I. FIFO with $N + 1$ pages of memory always performs better than FIFO with N pages of memory.
 - II. Paging approaches suffer from internal fragmentation, which decreases as the size of a page decreases
 - III. TLBs are more beneficial with multi-level page tables than with linear (single-level) page tables.
- Which of the following are TRUE?

A I

B III

Correct Option

C II

Correct Option

D All statements are true

YOUR ANSWER - NA

CORRECT ANSWER - b,c

STATUS - SKIPPED

Solution :

(b,c)

- I. False; FIFO with $N + 1$ pages can even perform worse (Belady's anomaly).
- II. True; internal fragmentation (the amount of wasted space) decreases if smaller units of allocation are used.
- III. True, because the cost of walking a multi-level page table is higher than walking a single level (i.e., more memory accesses are needed)

QUESTION ANALYTICS



Q. 54

FAQ Have any Doubt ?



Let Q denote a queue containing thirteen numbers and S be an empty stack. Head(Q) returns the element at the head of the queue Q without removing it from Q . Top(S) returns the element at the top of S without removing it from S . Both the cases are utilized until queue gets empty.

- I. We are dequeuing and pushing elements in stack if stack is empty or top(S) is \leq head(Q).
- II. We are popping and enqueueing if top(S) is $>$ head(Q).

The number of times this will be done for the worst case is _____.

169

Correct Option

Solution :

169

A queue is given with 13 elements.

Head(Q): return element from head of queue without removing it.

If top(S) \leq head(Q): dequeuing and pushing

If top(S) $>$ head(Q): popping and enqueueing

With these given conditions, worst case will be when queue Q is sorted in descending order.

That time there will be $n \times n$ condition check for making queue empty.

So, here $13 \times 13 = 169$ times.

QUESTION ANALYTICS



Q. 55

Solution Video Have any Doubt ?



Consider the following PDA:

$M = (Q, \Sigma, \Gamma, \delta, q_0, z, F)$, where $Q = \{q_0, q_1, q_2\}$, $\Sigma = \{0, 1\}$, $\Gamma = \{0, 1, z\}$, $F = \{q_0, q_2\}$

$\delta(q_0, 1, z_0) = \{(q_2, z_0)\}$
 $\delta(q_2, 1, z_0) = \{(q_2, z_0)\}$
 $\delta(q_0, 0, z_0) = \{(q_1, z_0)\}$
 $\delta(q_1, 0, z_0) = \{(q_1, 0z_0)\}$
 $\delta(q_1, 0, 0) = \{(q_1, 00)\}$
 $\delta(q_1, 1, 0) = \{(q_1, \epsilon)\}$
 $\delta(q_1, 1, z_0) = \{(q_2, z_0)\}$

The language accepted by the given PDA is

A $L = \{0^n 1^m \mid n = m \text{ and } n, m \geq 0\}$

B $L = \{0^n 1^m \mid n < m \text{ and } n, m \geq 0\}$

C $L = \{0^n 1^m \mid n \geq m \text{ and } n, m \geq 0\}$

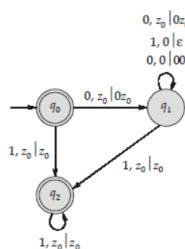
D None of these

Correct Option

Solution :

(d)

The given PDA is



The language accepted by the PDA is $\{\epsilon, 1, 11, 011, 0111, 001001111, 0111, \dots\}$.
001001111 is accepted by the PDA but not generated by any of the languages.

Q. 56

Have any Doubt ?



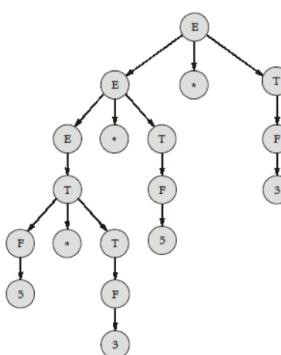
Consider the following syntax directed translation scheme:

$$\begin{aligned} E &\rightarrow E_1 \times T [E.\text{val} = E_1.\text{val} \times T.\text{val}] \\ E &\rightarrow T [E.\text{val} = T.\text{val}] \\ T &\rightarrow F - T_1 [T.\text{val} = F.\text{val} - T_1.\text{val}] \\ T &\rightarrow F [T.\text{val} = F.\text{val}] \\ F &\rightarrow 3 [F.\text{val} = 2] \\ F &\rightarrow 5 [F.\text{val} = 4] \end{aligned}$$

The output produced by the SDTS after evaluating the given expression is $5 - 3 \times 5 \times 3$. Assume attribute evaluation with bottom-up parsing, i.e., attributes are evaluated immediately after a reduction.

 A 15 B -42 C 30 D None of these

Correct Option

Solution :(d) Given string is $5 - 3 \times 5 \times 3$ 

$$(((5 - 3) \times 5) \times 3) \Rightarrow$$

$$F \rightarrow 3 \{F.\text{val} = 2\}$$

$$F \rightarrow 5 \{F.\text{val} = 4\}$$

$$(((4 - 2) \times 4) \times 2) \Rightarrow 16$$

Q. 57

Solution Video

Have any Doubt ?



Consider the following context free grammar:

$$\begin{aligned} S &\rightarrow bAB \mid bb \mid C \\ A &\rightarrow BC \mid aCB \mid \epsilon \mid a \\ B &\rightarrow bB \mid C \mid \epsilon \\ C &\rightarrow aaC \mid bbC \mid D \\ D &\rightarrow a \mid b \end{aligned}$$

The equivalent simplified (after elimination of unit, null, useless symbols) from the grammar is _____.

 A $\begin{aligned} S &\rightarrow bAB \mid bb \mid aaC \mid bbC \mid a \mid b \\ A &\rightarrow BC \mid aCB \mid a \\ B &\rightarrow bB \mid aaC \mid bbC \mid a \mid b \\ C &\rightarrow aaC \mid bbC \mid a \mid b \\ D &\rightarrow a \mid b \end{aligned}$ B $\begin{aligned} S &\rightarrow bAB \mid bb \mid aaC \mid bbC \\ A &\rightarrow BC \mid aCB \mid a \\ B &\rightarrow bB \mid aaC \mid bbC \mid a \mid b \\ C &\rightarrow aaC \mid bbC \mid a \mid b \end{aligned}$ C $\begin{aligned} S &\rightarrow bAE \mid bb \mid aaC \mid bbC \\ A &\rightarrow BC \mid aCB \mid a \\ B &\rightarrow bB \mid aaC \mid bbC \mid a \mid b \\ C &\rightarrow aaC \mid bbC \mid a \mid b \\ D &\rightarrow a \mid b \end{aligned}$ D None of these

Correct Option

Solution :

$$(d) \quad S \rightarrow bAB \mid bb \mid C$$

$$A \rightarrow BC \mid aCB \mid \epsilon \mid a$$

```

B → bB | C | ε
C → aaC | bbC | D
D → a | b
Eliminate null production:
S → bAB | bb | C | bB | bA | b
A → BC | aCB | a | C | aC
B → bB | C | b
C → aaC | bbC | D
D → a | b
Eliminate the unit production:
S → bAB | bb | aaC | bbC | a | b | bB | bA | b
A → BC | aCB | a | aaC | bbC | a | b | aC
B → bB | aaC | bbC | a | b | b
C → aaC | bbC | a | b
D → a | b
Eliminate useless production:
S → bAB | bb | aaC | bbC | a | b | bB | bA | b
A → BC | aCB | a | aaC | bbC | a | b | aC
B → bB | aaC | bbC | a | b | b
C → aaC | bbC | a | b

```

QUESTION ANALYTICS



Q. 58

? FAQ Have any Doubt ?



What will be the output of the following program.

```

#include<stdio.h>
int main()
{
    double *ptr = (double*)100;
    ptr = ptr + 2;
    printf("%d",ptr)
    return 0;
}

```

116

Correct Option

Solution :

116
`double *ptr = (double*)100; //here pointer ptr as double with value 100 is declared and value is also typecasted with double`
`ptr = ptr + 2; // double type has size 8 byte so double pointer step size is 8. If we are adding 2 in step pointer, it will add 16 to the address of double as`
`100 + 16 = 116`
`printf("%d", ptr); // it will print 116.`
`So, answer is 116.`

QUESTION ANALYTICS



Q. 59

Have any Doubt ?



Which C program will be executed successfully.

- I. #include <stdio.h>
`int main(void)`
`{`
 `int a = 1, 2, 3;`
 `printf("%d", a);`
 `return 0;`
`}`
- II. #include <stdio.h>
`int main(void)`
`{`
 `int a;`
 `a = 1, 2, 3;`
 `printf("%d", a);`
 `return 0;`
`}`

A I only

Correct Option

B II only

Correct Option

Solution :

(b)
We will review (i) and (ii) program line-by-line. And then we try to get where and which code line is making code erroneous.
`#include <stdio.h>`
`int main(void)`
`{`
 `int a = 1, 2, 3;`
 `printf("%d", a);`
 `return 0;`
`}`

This program will give error as error: expected unqualified -id before numeric constant. Because here, we are trying to assign multiple numeric values to a single variable that is incorrect. Initialization and declaration can not be done together with multiple values. That's why, code a is

```

giving error at compile time.
#include <stdio.h>
int main(void)
{
    int a; // declares variable a as integer type.
    a = 1, 2, 3; // here 1 is assigned to a, as all these three are treated individually.
    printf("%d", a); // 1 will be printed here.
    return 0;
}

```

So, this code will be executed successfully and will print 1 as output.
Answer is only (b) will be executed successfully.

C Both I and II

D None of above

QUESTION ANALYTICS

+

Q. 60

Solution Video

Have any Doubt?

Bookmark

Consider an undirected graph with n vertices, vertex 1 has degree 1, while each vertex 2, 3, ..., $n - 1$ has degree 4. The degree of vertex n is unknown. Which of the following statement are not TRUE?

A Vertex n has degree 1.

Correct Option

B Graph is connected

Correct Option

C There is a path from vertex 1 to vertex n .

D Spanning tree will include the edge connecting vertex 1 and n .

Correct Option

YOUR ANSWER - NA

CORRECT ANSWER - a,b,d

STATUS - SKIPPED

Solution :

(a, b, d)

- (a) By handshaking lemma you can argue that degree of n must be odd but it doesn't mean it will be 1 always.
Example: 1, 4, 4, 4, 4, 3 is a valid degree sequence.
- (b) Suppose the graph has 2 components as degree sequence $G_1 = 1, 4, 4, 4, 4, 3$ and $G_2 = 4, 4, 4, 4, 4$, which means, it is not always true that graph is connected.
- (c) Vertex 1 and vertex n should be a vertex of same component of graph otherwise each component will have exactly 1 vertex of odd degree and no graph can have odd number of vertices of odd degree. Graph is undirected and vertex 1 and n are connected so, there must be a path from 1 to n .
- (d) Not every spanning tree will contain the edge joining 1 to n .

QUESTION ANALYTICS

+

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Q. 61
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The memory locations 2000, 2001 and 2020 have data values 19, 1 and 16 respectively before the following program is executed.

MOVI	Rs, 1;	Move immediate
LOAD	Rd, 2000 (Rs);	Load from memory
ADDI	Rd, 2000;	Add immediate
STOREI	0(Rd), 20;	Store immediate

Which of the statements below is true after the program is executed?

- A** Memory location 2000 has value 20.
- B** Memory location 2020 has value 20.
- C** Memory location 2021 has value 20.
- D** Memory location 2001 has value 20.

Correct Option
Solution :

```
(d)
Rs ← 1
Rd ← 1
Rd ← 2001
Store in address 2001 ← 20
```

QUESTION ANALYTICS

Q. 62
[FAQ](#) [Have any Doubt ?](#)


Consider the set {4, 8, 12, 16} under multiplication modulo 20:

Which of the following is true?

S_1 : This set is a group.

S_2 : The identity element exists.

S_3 : The group is cyclic with generators as 8 and 12.

The options are:

- A** S_1
- B** S_3
- C** S_2
- D** None are true

Correct Option
Correct Option
Correct Option
YOUR ANSWER - NA
CORRECT ANSWER - a,b,c
STATUS - SKIPPED
Solution :

(a,b,c)

Here is the Cayley table for set $S = \{4, 8, 12, 16\}$ under multiplication modulo 20:

	4	8	12	16
4	16	12	8	4
8	12	4	16	8
12	8	16	4	12
16	4	8	12	16

We observe that the identity is element 16. Let's now find the generators by checking one by one.

- $\langle 4 \rangle = [16, 4]$ [4 is not the generator because not generating every element]
- $\langle 8 \rangle = [16, 8, 4, 12] = S$
- $\langle 12 \rangle = [16, 12, 4, 8] = S$

As there is generators 8 and 12. Hence it is cyclic.

QUESTION ANALYTICS

Q. 63
[FAQ](#) [Solution Video](#) [Have any Doubt ?](#)


In the infix-to-postfix expression conversion algorithm, given an infix expression:

$a + (b - c) - d * ((e - f) / g + h)$

What will be the maximum size of the operator stack is required.

Solution :
5

We scan the equation from left to right.
 $a + (b - c) - d * ((e - f) / g + h)$

Current	Operator stack	Postfix expression
a	+	a
+	+()	
(+()	
b	+()	ab
-	+(-)	abc
c	+(-)	abc-
)	=	abc-+
d	-	abc-+d
*	-^	abc-+d
(-^()	abc-+d
(-^()	abc-+d
e	-^()	abc-+de
-	-^((-))	abc-+de
f	-^((-))	abc-+def
)	-^()	abc-+def-
/	-^(/)	abc-+def-
g	-^(/)	abc-+def-g
+	-^(+)	abc-+def-g/h
h	-^(+)	abc-+def-g/h+^=
)	-^=	

Hence the maximum size of the operator stack is 5.

QUESTION ANALYTICS

Q. 64

? FAQ Solution Video Have any Doubt ?

How many minimal SOP expression are possible for the below given k-map?

Y\Z	00	01	11	10
W\X	00	1		0
01		1	1	
11	1	1	1	
10	1			1

2

Correct Option

Solution :

2

$XZ + X'Z' + WY'Z'$ and $XZ + X'Z' + WXY'$

Total 2 minimal SOP expression are possible for the given k-map.

QUESTION ANALYTICS

Q. 65

? FAQ Have any Doubt ?

Assume that a process has CPU burst time for last three runs as 4, 5 and 4 sec (last). Given that last predict burst time was 5 and $\alpha = 0.8$. The next predict of CPU burst time for process when CPU scheduler is shortest process next with exponential averaging is _____ in sec. (Upto 1 decimal places)

4.2

Correct Option

Solution :

4.2

$$T_n + 1 = \alpha t_n + (1 - \alpha) T_n$$

where $T_n + 1$ is the predicted value of the next CPU burst time.

$$0 \leq \alpha \leq 1$$

T_n is the predicted value of the last CPU burst (here $T_n = 5$ s), t_n is the (actual) last run time of the process (here t_n is 4 s) and $\alpha = 0.8$.

Putting in all values,

$$T_4 = 0.8 \times 4 + (1 - 0.8 \times 5) = 3.2 + 1 = 4.2 \text{ sec}$$

So, the next predict of CPU burst time for process is 4.2 sec.

QUESTION ANALYTICS