



Kunal Jha

 Course: GATE  
 Computer Science Engineering(CS)

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## FULL SYLLABUS TEST-8 (ADVANCE LEVEL) (GATE - 2021) - REPORTS

[OVERALL ANALYSIS](#)
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**Q. 1**
[Solution Video](#)
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Select the word that is farthest in meaning to the bold word in capital letters.

**INDIGENCE**
 A Prosperity

[Correct Option](#)

 Solution :  
 (a)

 B Poverty

 C Suffering

 D Scarcity

### QUESTION ANALYTICS


**Q. 2**
[Solution Video](#)
[Have any Doubt?](#)


Select the word that is NEAREST in meaning to the bold word in capital letters.

**ADMONISH**
 A Exhort

[Correct Option](#)

 Solution :  
 (a)

 B Love

 C Flatter

 D Respect

### QUESTION ANALYTICS


**Q. 3**
[FAQ](#)
[Solution Video](#)
[Have any Doubt?](#)


Elle is three times older than Yogesh, Zaheer is half the age of Wahida, Yogesh is older than Zaheer. Which of the following can be inferred from this given data.

 A Yogesh is older than Wahida.

 B Elle is older than Wahida.

[Correct Option](#)

 Solution :  
 (b)

$$\text{Yogesh age} = Y$$

$$\text{Elle age} = E = 3Y$$

$$\text{Zaheer age} = Z$$

$$\text{Wahida age} = W$$

$$\text{It is given, } Z = \frac{1}{2}W$$

$$\text{Also, } Y < Z$$

$$\therefore 3Y > 3Z$$

$$E > \frac{3W}{2} \quad \left( \because t = 3Y, Z = \frac{1}{2}W \right)$$

$$E > 1.5W$$

So age of Elle &gt; Wahida.

 C Elle may be younger than Wahida.

 D None of these

### QUESTION ANALYTICS



Q. 4

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

At a reputed Engineering College in Delhi, total expenses of a semester are partly fixed and partly varying linearly with the number of students. The average expenses per student is ₹400 where there are 20 students and ₹600 when there are 40 students. When there are 80 student, the average expenses per student is

 A ₹4200 B ₹800 C ₹1000

Correct Option

**Solution :**  
(c)

$$\text{Total expense} = \text{Fixed} + \text{Variable} \times \text{Number of students}$$

Let the fixed expenses is  $x$  and variable expenses is  $y$  per student.

According to given data

$$\begin{aligned}x + 20y &= 400 \\x + 40y &= 600\end{aligned}$$

$$y = 10$$

$$\text{From here, } x = 200$$

$$\text{Average expenses when there are 80 students} = 200 + 80 \times 10 = ₹1000.$$

 D ₹4080

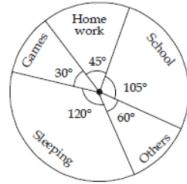
QUESTION ANALYTICS

+

Q. 5

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

The following pie chart shows the hourly distribution (in degree) of all the major activities of a student.

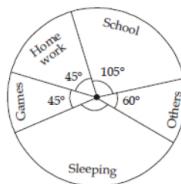


If the time spent in game is made equal to the time spent in homework while time spent in other activities remains constant except sleeping, then percentage decrease in time of sleeping is \_\_\_\_\_.

 C 12.5 (12.4 - 12.6)

Correct Option

**Solution :**  
12.5 (12.4 - 12.6)  
The modified pie chart will be



$$\text{Angle of sleeping} = 360^\circ - (105^\circ + 45^\circ + 45^\circ + 60^\circ) = 105^\circ$$

$$\text{Decreasing in sleeping hours} = 120 - 105 = 15^\circ$$

$$\% \text{ decrease in sleeping hours} = \frac{15^\circ}{120^\circ} \times 100 = 12.5\%$$

QUESTION ANALYTICS

+

Q. 6

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

A quiz competition was organised in a school and the performance of students was recorded on a paper. But somehow the information remained incomplete. However, the score has some dues.

I. Half the student were either excellent or good.

II. 40% of the students are females.

III. One-third of the male students were average.

What will be the number of average females, excellent females respectively?

 A 0, 30 B 18, 8 C 27, 0

Correct Option

**Solution :**

(c)

Let  $x$  be total students.

From due II:

$$\Rightarrow 0.4x = 36$$

$$\Rightarrow x = 90$$

From due I:

$$\text{Number of average student} \Rightarrow 0.5x = 45$$

$$\text{Now total excellent student} = 90 - [\text{Average student} + \text{Good student}]$$

$$= 90 - [45 + 33] = 12$$

From given table number of excellent female =  $12 - 12 = 0$

	Average	Good	Excellent	Total
Male	18	24	12	54
Female	27	9	0	36
Total	45	33	12	90

Total number of female student = 36

$$\therefore \text{Number of male student} = 90 - 36 = 54$$

$$\text{It is given that } \frac{1}{3} \text{ rd of male student are average} = \frac{1}{3} \times 54 = 18.$$

Total average students are 45.

Therefore number of average female are 27.

D None of these

QUESTION ANALYTICS



Q. 7

Solution Video

Have any Doubt?



If  $x = 7 + 4\sqrt{3}$  and  $xy = 1$ , then what is the value of  $\left[ \frac{1}{x^2} + \frac{1}{y^2} \right]$

A 194

Correct Option

Solution:

(a)

$$\begin{aligned} y &= \frac{1}{x} = \frac{1}{7+4\sqrt{3}} = 7 - 4\sqrt{3} \\ \Rightarrow \frac{1}{x^2} + \frac{1}{y^2} &= \frac{x^2 + y^2}{x^2 y^2} \\ &= \frac{(7+4\sqrt{3})^2 + (7-4\sqrt{3})^2}{(7+4\sqrt{3})^2 \cdot (7-4\sqrt{3})^2} = \frac{2(49+48)}{12} = 194 \end{aligned}$$

B 57

C  $85\sqrt{3}$

D  $\frac{7+4\sqrt{3}}{7-4\sqrt{3}}$

QUESTION ANALYTICS



Q. 8

Solution Video

Have any Doubt?



There are 5 books A, B, C, D and E placed on the table. If A is placed immediately below E, C is placed immediately above D, B is placed immediately below A, D is placed immediately above E, then which of the book is at the bottom?

A C

B A

C B

Correct Option

Solution:

(c)

The order of book is

C

D

E

A

B

$\Rightarrow$  B is at the bottom.

D E

QUESTION ANALYTICS



Q. 9

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

A page contains 60 lines. A chapter contain 125 pages. A book contains 5 chapters. 20 such books form a bound. If there are totally 30 lakh lines in  $x$  number of bound, then value of  $x$  is

**A** 0.25**B** 4

Correct Option

**Solution :**  
 (b)

$$\begin{aligned}\text{Number of bounds } x &= \frac{\text{Lines}}{60 \times 125 \times 5 \times 20} \\ &= \frac{3000000}{60 \times 125 \times 5 \times 20} = 4\end{aligned}$$

**C** 144**D** 25

QUESTION ANALYTICS



Q. 10

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

A Lad was asked his age by his friend. The Lad said, the number you get when you subtract 25 times my age from twice the square of my age will be thrice your age. If the friend's age is 14 years, than the age of the Lad is

**A** 14 years

Correct Option

**B** 28 years**C** 1.5 years**D** 42 years

YOUR ANSWER - NA

CORRECT ANSWER - a

STATUS - SKIPPED

**Solution :**

(a)

Let the Lad's age is  $x$  years.

According to given data

$$2x^2 - 25x = 3 \times 14$$

$$2x^2 - 25x - 42 = 0$$

$$x = 14, -\frac{3}{2}$$

 $\Rightarrow$  Since age can't be negative. $\Rightarrow$  Lad's age = 14 years

QUESTION ANALYTICS

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OVERALL ANALYSIS    COMPARISON REPORT    **SOLUTION REPORT**

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

Q. 11

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

Consider the following relational schema:  
**Suppliers** (sid integer, sname string, address string)  
**Parts** (pid integer, pname string, color string)  
**Catalog** (sid integer, pid integer, cost real)  
 Which of the following is correct about the below given SQL query?  
`SELECT C.sid  
 FROM Catalog C  
 WHERE NOT EXISTS (SELECT P.pid  
 FROM Parts P  
 WHERE (P.color = 'red' OR P.color = 'green')  
 AND (NOT EXISTS (SELECT C1.sid  
 FROM Catalog C1  
 WHERE C1.sid = C.sid AND  
 C1.pid = P.pid)));`

**A** Result the sids of suppliers who supply every red or every green part.

**B** Result the sids of suppliers who do not supply any red or green part.

**C** Result the sids of suppliers who supply every red and green part.

Correct Option

**Solution :**

(c)

In the given query there are two inner subqueries with NOT EXISTS conditions. As we know that NOT EXISTS clause will return true only when no tuple is returned by the inner subquery. The innermost query will return false which is AND'ed with the outer query. The inner query will return only those tuples whose part colors are not red or green. Thus, the outermost NOT EXISTS clause will print only those tuples sid's who supply every red or green part.

**D** Result the sids of suppliers who do not supply some red or green part.

### QUESTION ANALYTICS

Q. 12

[FAQ](#)    [Have any Doubt ?](#)

Consider the following statement P:

P : For a binary search tree (BST), the inorder traversal is always in ascending order.  
 Which of the following is correct?

**A** P is true, so is its converse.

Correct Option

**Solution :**

(a)

For a binary search tree (BST) the inorder traversal is always in ascending order. And the converse is also true. If inorder traversal of a tree is in ascending order then the tree will definitely be a BST.

**B** P is true But its converse is false.

**C** P is false, but its converse is true.

**D** Both P and P's converse are false.

### QUESTION ANALYTICS

Q. 13

[Have any Doubt ?](#)

The entire host name has a maximum of

**A** 255 characters

Correct Option

**Solution :**

(a)

An entire host name can have a maximum of 255 characters.  
 Although each label should be from 1 to 63 character long.

**B** 127 characters

**C** 63 characters

**D** 31 characters

Q. 14

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

The Karnaugh map shown below represents a switching function  $Y(A, B, C, D)$ .

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

The minimized expression for  $Y$  is

A  $A'B' + A'C' + B'C + ABD'$

B  $A'C' + B'C + ABD'$

Correct Option

Solution :

(b)

Minimized expression is asked. We have two essential prime implicants: (0, 1, 4, 5) and (2, 3, 10, 11). Every EPI is definitely present in every expression. So, after including these two EPIS, we have two 1's remaining to cover. These can be covered by the term  $ABD'$ . Hence, answer is option (b).

C  $A'B' + C'D' + ACD'$

D  $A'B' + A'C' + AC$

Q. 15

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

Full adder is the adder which adds three inputs and produces two outputs. The first two inputs are  $A$  and  $B$  and the third input is an input carry as  $C_{IN}$ . The output carry is designated as  $C_{OUT}$  and the normal output is designated as  $S$  which is SUM. Which of the following correctly represents logical expression for SUM and  $C_{OUT}$  of a full adder?

A  $SUM(A, B, C_{IN}) = (1, 2, 5, 7), C_{OUT}(A, B, C_{IN}) = (3, 4, 6, 7)$

B  $SUM(A, B, C_{IN}) = (1, 2, 5, 7), C_{OUT}(A, B, C_{IN}) = (1, 2, 4, 7)$

C  $SUM(A, B, C_{IN}) = (1, 2, 4, 7), C_{OUT}(A, B, C_{IN}) = (3, 5, 6, 7)$

Correct Option

Solution :  
(c)

Inputs			Outputs	
A	B	$C_{in}$	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

D  $SUM(A, B, C_{IN}) = (1, 2, 4, 7), C_{OUT}(A, B, C_{IN}) = (1, 2, 3, 7)$

Q. 16

[Have any Doubt ?](#)

A grammar is said to be "useless" if and only if it produces no terminal strings. If  $S$  is the start symbol, which of the following grammars is (are) "useless"?

I.  $S \rightarrow AB \mid AS$

$A \rightarrow B \mid a$

$B \rightarrow A \mid b$

II.  $S \rightarrow SA \mid AS \mid SB$

$A \rightarrow a$

$B \rightarrow a \mid b$

III.  $S \rightarrow \epsilon \mid A$

$A \rightarrow B$

$B \rightarrow C$

$C \rightarrow a$

A None of these

B Only II

Correct Option

**Solution :**

(b)  
Grammar II will not generate any string because we can never get rid of non-terminal S.

A Only III

B Only II, III

 QUESTION ANALYTICS


Q. 17

[Have any Doubt ?](#)


Consider the following statements:

- $S_1$  : If every node in a binary tree has either 0 or 2 children, then the height of the tree is (logn).
- $S_2$  : An AVL tree is balanced, therefore a median of all elements in the tree is always at the root or one of its two children.
- $S_3$  : An insertion in an AVL with n nodes requires (n) rotations.
- $S_4$  : The depths of any two leaves in a max heap differ by at most 1.

Which of the above statement(s) are incorrect?

A  $S_1$  and  $S_2$  only

B  $S_3$  and  $S_4$  only

C  $S_1, S_2$  and  $S_3$

Correct Option

**Solution :**

(c)

$S_1$  is false because tree could go to height  $\frac{n}{2}$  in worst case.

$S_2$  is false because AVL tree, thought balanced, doesn't provide such guarantee.

$S_3$  is false because insertion take at most 2 rotations.

$S_4$  is true because heaps are complete binary trees.

D All of the above

 QUESTION ANALYTICS


Q. 18

[FAQ](#) [Have any Doubt ?](#)


Consider the set of all regular languages which does not contain empty language.

i.e.  $L = \{\text{All regular language}\} - \{\emptyset\}$

The above set L is not closed under

A Concatenation

B Union

C Intersection

Correct Option

**Solution :**

(c)

Let,  $L_1 = \{a\}$  and  $L_2 = \{b\}$

$$L_1 \cap L_2 = \{\} = \emptyset$$

Which does not belong to the set L. Thus, set L is not closed under intersection.

D Kleene star

 QUESTION ANALYTICS


Q. 19

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


According to the IEEE standard, a 32-bit, single-precision, floating-point number N is defined to be  $N = (-1)^S \times 1.F \times 2^{E-127}$  where S is the sign bit, F the fractional mantissa and E the biased exponent. A floating-point number is stored as S: E: F, where S, E and F are stored in 1 bit, 8 bits and 23 bits, respectively.

What is the decimal value of the floating-point number C<sub>1</sub>E00000 (hexadecimal notation)?

A -12

B -15

C -26

D -28

Correct Option

**Solution :**

(d)

Given floating number:

$$C_1.E00000 = 1100\ 0001\ 1110\ 000000000000000000000$$

Sign bit  $S = 1$  (MSB bit)

Biased exponent  $E : 100\ 0001\ 1 = 131$

Mantissa  $F : 1100\ 000\ 0000000000000000$

Hence, the number

$$N = (-1)^1 \times 1.F \times 2^{131-127}$$

$$N = (-1)^1 \times 1.11000 \dots 0 \times 2^4$$

$$N = (-1)^1 \times 11100.0 \dots 0$$

Which in decimal is -28.

QUESTION ANALYTICS



Q. 20

Solution Video

Have any Doubt?



Consider a disk queue with requests for I/O blocks on cylinders 38, 180, 95, 119, 121, 11, 64, 62. The C-LOOK scheduling algorithm is used. The head is initially at cylinder number 50 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. Let the total head movement (in number of cylinders) incurred while servicing these requests using the C-LOOK scheduling algorithm is X and the total head movement incurred while servicing these requests using the C-SCAN scheduling algorithm is Y. Find  $Y - X$ ? (Long jump is also considered while counting the total head movements)

60

Correct Option

Solution :

60

C-LOOK

Total head movements incurred while servicing these requests

$$= (62 - 50) + (64 - 62) + (95 - 64) + (119 - 95) + (121 - 119) + (180 - 121) + (180 - 11) + (38 - 11)$$

$$= 12 + 2 + 31 + 24 + 2 + 59 + 169 + 27 = 326$$

C-SCAN

Total head movements =  $(62 - 50) + (64 - 62) + (95 - 64) + (119 - 95) + (121 - 119) + (180 - 121) +$

$$(199 - 180) + (199 - 0) + (11 - 0) + (38 - 11) = 386$$

$$Y - X = 60$$

QUESTION ANALYTICS



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ALL(65)

CORRECT(0)

INCORRECT(0)

SKIPPED(65)

Q. 21

Solution Video

Have any Doubt ?

The value of  $\lambda$ , such that the system of equation

$$2x - y + 2z = 2$$

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

$$x + y + \lambda z = 4$$

Has no solution if

 A 3 B 1

Correct Option

Solution :

(b)

$$\begin{vmatrix} 2 & -1 & 2 & 2 \\ 1 & -2 & 1 & -4 \\ 1 & 1 & \lambda & 4 \end{vmatrix}$$

 $R_3 \rightarrow R_3 + R_2$ 

$$\begin{vmatrix} 2 & -1 & 2 & 2 \\ 1 & -2 & 1 & -4 \\ 2 & -1 & \lambda+1 & 0 \end{vmatrix}$$

for

$$\rho(A) \neq \rho(B)$$

$$\lambda + 1 = 2$$

$$\lambda = 2 - 1$$

$$\lambda = 1$$

 C 0 D -3

QUESTION ANALYTICS



Q. 22

Have any Doubt ?



The length of the longest cycle in the digraph of partial order is

 A 1

Correct Option

Solution :

(a)

- Cycle of length 1 is not only possible but necessary since reflexive property is required for partial order.
- Cycle of length 2 and above not possible because cycle of length 2 i.e. violates anti-symmetric property.

 B 2 C 3 D 4

QUESTION ANALYTICS



Q. 23

FAQ

Have any Doubt ?



Consider the following statements:

 $S_1$  : Lexemes are said to be a sequence of characters alphanumeric in a token. $S_2$  : There are some predefined rules for every lexeme to be identified as a valid token. $S_3$  : In programming language, keywords, constants, identifiers, strings, numbers, operators and punctuation symbols can be considered as tokens.

Which of the above statement is INCORRECT?

 A Only  $S_1$  B Only  $S_2$  C Only  $S_3$

D None of these

Correct Option

Solution :

(d) Lexemes are said to be a sequence of characters (alphanumeric) in a token. True

$S_1$  : There are some predefined rules for every lexeme to be identified as a valid token. True

$S_3$  : Keywords, operators, identifiers (names), constants, literal strings, punctuation symbols such as parentheses, brackets, commas, semicolons, and colons, etc. True  
int value = 100; int (keyword), value (identifier), = (operator), 100 (constant) and ; (symbol).

QUESTION ANALYTICS



Q. 24

? FAQ

Have any Doubt ?



The server handle the requests for other domain

A Directly

B By contacting the remote DNS server

Correct Option

Solution :

(b)

Whenever a request is received at server from other domains. It handles this situation by contacting remote DNS server.

C It is not possible

D None of these

QUESTION ANALYTICS



Q. 25

? FAQ

Solution Video

Have any Doubt ?



Consider a system where each process has a virtual address space of  $2^v$  bytes. The physical address space of the system is  $2^p$  bytes, and the page size is 2k bytes. The size of each page table entry is  $2^e$  bytes. The system uses hierarchical paging with N levels of page tables, where the page table entries in the last level point to the actual physical pages of the process. Assume N ≥ 2. Let  $v_0$  denote the number of (most significant) bits of the virtual address that are used as an index into the outermost page table during address translation.

What is the number of logical pages of a process?

A  $2^p - k$

B  $2^v - k$

Correct Option

Solution :

(b)

$$\text{Number of virtual pages} = \frac{2^v}{2^k}$$

C  $2^p - e$

D  $2^v - e$

QUESTION ANALYTICS



Q. 26

? FAQ

Have any Doubt ?



How many lists (words/strings) without repeats can be formed from a 5-letter set? (Including empty list)

326

Correct Option

Solution :

326

5-lists without repeats =  $5! = 120$

4-lists without repeats =  ${}^5C_4 \times 4! = 120$

3-lists without repeats =  ${}^5C_3 \times 3! = 60$

2-lists without repeats =  ${}^5C_2 \times 2! = 20$

1-lists without repeats =  ${}^5C_1 \times 1! = 5$

0-lists without repeats (empty) =  ${}^5C_0 \times 0! = 1$

By the rule of sum, this gives a total of 326.

QUESTION ANALYTICS



Q. 27

Have any Doubt ?



Given binary relation on  $R$ ,  $xRy$  if  $\exists n \in \mathbb{Z}$  (integers) such that  $x^2 + y^2 = n^2$ . Find the number of statements which are correct?

- I.  $R$  is reflexive and symmetric.
- II.  $R$  is symmetric but not transitive.
- III.  $R$  is symmetric.
- IV.  $R$  is symmetric and transitive.

2

Correct Option

Solution :

2

- It is not reflexive because  $1R1$ .
- Example:  
Let's take  $x = y = 1$   
Then  $(1)^2 + (1)^2 = n^2$   
 $2 = n^2$   
 $n = \sqrt{2}$  but  $\sqrt{2} \notin \mathbb{Z}$
- Similarly it is not transitive as  $1R0$  and  $0R1$  but  $1R1$ .
- It is symmetric because  $x^2 + y^2 = n^2$  implies that  $y^2 + x^2 = n^2$ .

QUESTION ANALYTICS



Q. 28

Have any Doubt ?



Define an equivalence relation  $R$  on the positive integers  $A = \{2, 3, 4, \dots, 20\}$  by  $mRn$  if the largest prime divisor of  $m$  is the same as the largest prime divisor of  $n$ . The number of equivalence classes of  $R$  is \_\_\_\_\_.

8

Correct Option

Solution :

8

All the prime numbers will have to go to different equivalence classes. Remaining all elements will go to some of these classes. So, total 8 equivalence classes because there are 8 prime numbers below 20.

QUESTION ANALYTICS



Q. 29

FAQ

Solution Video

Have any Doubt ?



Time complexity of an algorithm  $T(n)$ , where  $n$  is the input size is given by

$$T(n) = \begin{cases} \frac{T(n-1)+1}{n}, & \text{if } n > 1 \\ n, & \text{otherwise} \end{cases}$$

The order of this algorithm is

A  $\log n$

Correct Option

Solution :

(a)

$$\begin{aligned} T(n) &= \frac{T(n-1)+1}{n} \\ T(n-1) &= \frac{T(n-2)+1}{(n-1)} \\ T(n-2) &= \frac{T(n-3)+1}{(n-2)} \end{aligned}$$

After moving like this, final equation we get as:

$$T(n) = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \dots + \frac{1}{(n-2)} + \frac{1}{(n-1)} + \frac{1}{n}$$

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

So option (a) is the correct answer.

B  $n$

C  $n^2$

D  $n^n$

QUESTION ANALYTICS



Q. 30

Have any Doubt ?



We have a singly linked list constructed out of nodes defined as follows:

struct node {int value; struct node \*next;};

In the function shown below, the parameter "first" refers to the first node of the linked list, if there is one, and has the value null otherwise. The intent of the function is to remove the last node of the linked list.

void removelast(struct node \*first)

{

    struct node \*p, \*q;

    p = first;

    q = p -> next;

    while (q -> next != null) {

```
        p = q;
        q = q->next;
    }
    p->next = null;
}
```

Which of the following describes the class of the linked lists for which this function works correctly?

A No linked list.

B All non empty linked list.

C All linked lists with more than one node.

Correct Option

**Solution :**

(c)

If the list is empty then  $p$  will be null and  $q = p \rightarrow \text{next}$  will fail.  
If the list has only one node, then  $p \rightarrow \text{next}$  will be null and  $q \rightarrow \text{next} \neq \text{NULL}$  will fail.  
So, answer is option (c).

D All linked lists.

 QUESTION ANALYTICS

+

Item 21-30 of 65 « previous 1 2 3 4 5 6 7 next »



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

Q. 31

FAQ    Solution Video    Have any Doubt ?

Consider the following loop:  
`for(i = 1; i < n; i++)  
 for(j = 1; j < n; j = j + i)  
 print("%d%d", i, j);`

What is the time complexity of the above loop?

A O( $n$ )

B O( $n \log n$ )

Correct Option

Solution :

(b)  
 First loop runs  $n$  times.  
 Second times runs  $\frac{n}{2}$  times.  
 Last loops runs 1 times.  
 Hence  $n + \frac{n}{2} + \frac{n}{3} + \frac{n}{4} \dots 1$   
 $T.C = O(n \log n)$

C O( $n^2n$ )

D O( $\log n$ )

QUESTION ANALYTICS

Q. 32

Have any Doubt ?

Consider the following statements about intermediate Codes:

$S_1$  : The Syntax tree formed after syntax and semantic analysis used for intermediate code generation.

$S_2$  : A three address code instruction have at most 3 operands and at most 1 operator.

$S_3$  : Intermediate code generation is concerned with the production of a simple machine independent representation of the source program.

Which of the above statements are INCORRECT?

A Only  $S_2$

Correct Option

Solution :

(a)  
 Only  $S_2$  because at most two operators and not one. One is assignment operator and one is the other operator.

B Only  $S_1$

C Only  $S_3$

D None of these

QUESTION ANALYTICS

Q. 33

Solution Video    Have any Doubt ?

A certain J-K FF has a propagation delay of 12 ns. The largest MOD of the counter such that a ripple counter can be designed from these FFs which will operate up to 10 MHz?

256

Correct Option

Solution :  
 $256$

Time period of clock pulse =  $\frac{1}{10}$  MHz =  $10^{-7}$  sec

Propagation delay of each flip-flop =  $12 \times 10^{-9}$  sec

Number of flip-flop  $\leq \frac{t_{\text{clk}}}{t_{\text{pd}}} = \frac{10^{-7}}{12 \times 10^{-9}} = 8.33 = 8$

MOD  $\leq 2^N = 2^8 = 256$

QUESTION ANALYTICS

Q. 34

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

The gray code for decimal number 6 is equivalent to \_\_\_\_\_.

 A 1100

 B 1001

 C 0101

Correct Option

Solution :

(c)

$$6 = 0110$$

Grey code will be 0101.

 D 0110

 QUESTION ANALYTICS


Q. 35

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

Which of the following solutions to the synchronization problem is/are not implemented in the user mode?

 A Lock variable

 B Bakery algorithm

 C Strict alternation

 D None of the above

Correct Option

 YOUR ANSWER - NA

 CORRECT ANSWER - d

 STATUS - SKIPPED

Solution :

(d)

All the three are implemented in the user mode. They don't require hardware support. These are software based solutions and are therefore desirable solutions.

 QUESTION ANALYTICS


Q. 36

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

Consider an CSMA/CD where bandwidth of the cable is 60 Mbps and speed of the signal is  $3 \times 10^8$  m/s. What will be the efficiency of the channel where the length of the cable is 200 m and frame size is 200 bits? (upto 2 decimal places)

 0.43 (0.43 - 0.44)

Correct Option

Solution :

0.43 (0.43 - 0.44)

$$\text{Transfer time} = \frac{\text{Data size}}{\text{Bandwidth}}$$

$$\frac{200}{(60 \times 10^6)} = 3.3 \times 10^{-6} = 3.3 \text{ mu sec}$$

$$\text{Propagation time} = \frac{200}{(3 \times 10^8) \text{ m/s}} = 0.66 \text{ mu sec}$$

$$\text{Efficiency} = \frac{1}{(1 + 6.44a) \times 100\%}$$

$$a = \frac{\text{Propagation time}}{\text{Transfer time}} = \frac{0.66}{3.3} = 0.2 \text{ mu sec}$$

$$= \frac{1}{(1+6.44 \times 0.2)} = 43.7\%$$

 QUESTION ANALYTICS


Q. 37

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

If the fragment offset of the packets in the network layer are 0, 30, 60, 90 and the size of the header is 20 B. What will be the size of the packet if all the fragments are of equal size and also there are no padding bits in the last fragment in bytes?

 980

Correct Option

Solution :

980

First fragment = 0 - 29 = 30

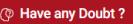
Second fragment = 30 - 59 = 30

Third fragment = 60 - 89 = 30

Last fragment =  $90 - 119 = 30$   
 Size of fragment =  $30 \times 8 = 240$  B  
 Total 5 fragment =  $240 \times 4 = 960$  B  
 Size of packet = Header + Data =  $960 + 20 = 980$  B

### QUESTION ANALYTICS

Q. 38

? FAQ 

For which of the following does there exist a graph  $G = (V, E)$  satisfying the specified conditions?

A Tree with 9 vertices and the sum of the degrees of all the vertices is 18.

B A graph with 5 components 12 vertices and 7 edges.

Correct Option

Solution :

(b)

In any graph with  $n$ -vertices,  $e$  edges and  $k$ -component the following inequality must be satisfied.

$$(n - k) \leq e \leq \frac{(n - k)(n - k + 1)}{2}$$

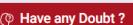
- In option (a) will have cycle which contradicts definition of tree.
- In option (b)  $n = 12$ ,  $e = 7$  and  $k = 5$  satisfies the above equation.
- In option (c) violates because it has only 24 edges instead it should have atleast 25 edges using above formula.
- In option (d) will have cycle but it is mentioned does not have cycle which contradicts.

C A graph with 5 components 30 vertices and 24 edges.

D A graph with 9 vertices, 9 edges and no cycles.

### QUESTION ANALYTICS

Q. 39

▶ Solution Video 

D number of friends go to a Chinese restaurant at a busy time of the day. The waiter apologetically explains that the restaurant can provide only a few chopsticks to be shared among the D people. Furthermore, each diner may require a different number of chopsticks to eat. For example, it is possible that one of the diners is an octopus, who for some reason refuses to begin eating before acquiring eight chopsticks. The second parameter of this scenario is C, the number of chopsticks that would simultaneously satisfy the needs of all diners at the table. For example, two octopus would result in  $C = 16$ . All the chopsticks provided by the waiter are placed in an empty glass at the center of the table and each diner obeys the following protocol: Acquire chopsticks one after one and start eating only after having the required number of chopsticks. If no more chopstick is available then hold the current chopsticks and wait for more chopsticks. Once all chopsticks acquired, then eat and release all chopsticks. Also while one person is using a chopstick then unless he releases it after completion of eating, it can not be shared with any other person (i.e. Chopsticks are used in mutual exclusion manner). What is the smallest number of chopsticks (in terms of D and C) needed to ensure that deadlock cannot occur?

A C

B D

C  $C - D$

D  $C - D + 1$

Correct Option

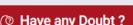
Solution :

(d)

$C - D + 1$ . This guarantees that every diner can get all but one of the chopsticks it needs ( $C - D$ ), with one additional chopstick to guarantee that at least one diner gets all of the chopsticks it needs.

### QUESTION ANALYTICS

Q. 40



Consider the following C function:

```
void fun( )
{
    int a[5][6][7] = {0};
    /* Missing Statement */
    printf("%d", a[1][2][3]);
}
```

Which of the following could be used in place of missing statement so that the output is 4?

$S_1 : a[1][2][3] = 4;$

$S_2 : *(*(a + 1) + 2) + 3 = 4;$

$S_3 : (*(*((a + 1) + 2)))[3] = 4;$

$S_4 : *((int*)a + 1 * 6 * 7 + 2 * 7 + 3) = 4;$

A  $S_1$  only

B  $S_2$  only

C  $S_3$  only

D  $S_1, S_2, S_3$  and  $S_4$

Correct Option

**Solution :**

(d)

All expression are same, all can be used in place of missing statement so that output will be 4.

 QUESTION ANALYTICS

+

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ALL(65)

CORRECT(0)

INCORRECT(0)

SKIPPED(65)

FAQ

Solution Video

Have any Doubt ?



Q. 41

FAQ

Solution Video

Have any Doubt ?



Consider an array A which contains 9 distinct positive integers in some order. Total number of ordering possible with those 9 elements such that array A represents a max heap is \_\_\_\_\_?

896

Correct Option

Solution :

896

Maximum element will be the first element in all such orderings. Remaining 8 elements will be placed such that 3 elements will be in right subtree and 5 elements will be in left subtree. So, for right subtree, select 3 elements from 8 elements and then we can place those 3 elements in the right subtree in 2 ways. Similarly remaining 5 elements can be put in  ${}^4C_1 * 2$  ways in the left subtree. So, total orderings possible =  ${}^8C_3 * 2 * {}^4C_1 * 2 = 896$ .

QUESTION ANALYTICS



Q. 42

Have any Doubt ?



Eleven toys are to be distributed among 4 children. How many ways can this be done if the oldest child is to receive only 2 toys and each of the other children is to receive 3 toys?

92400

Correct Option

Solution :

92400

We can do this directly if we are used to thinking in terms of multinomial coefficients.

We could also do it by converting the problem into one of our previous interpretations.

**Here is the first:** We want an ordered partition of 11 toys into 4 piles ("blocks") such that the first pile (for the oldest child) contains 2 and each of the 3 remaining piles contain 3 toys. This is an

ordered partition of type (2, 3, 3, 3). The number of them is  $\binom{11}{2, 3, 3, 3} = 92400$ .

**Here is the second:** Think of each child as a box into which we place toys. The number of ways to

fill the boxes is, again,  $\binom{11}{2, 3, 3, 3}$ .

QUESTION ANALYTICS



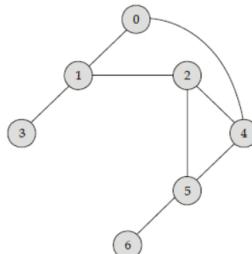
Q. 43

FAQ

Have any Doubt ?



There are 7 systems (0, ..., 6) connected as given in the figure.



What is the minimum number of connections to be added to the network so that when a system goes down, the rest of the network is still connected?

1

Correct Option

Solution :

1

Edge (3, 6) will make the network free from articulate points (cut vertex).

QUESTION ANALYTICS



Q. 44

FAQ

Solution Video

Have any Doubt ?



A processor has 64 registers and uses 16 bit instruction format. It has two types of instructions: **I-type** and **R-type**. Each **I-type** instruction contains an opcode, a register name, and a 4-bit immediate value. Each **R-type** instruction contains an opcode and two register

names. If there are 14 distinct I-type opcodes, then the maximum number of distinct R-type opcodes is \_\_\_\_\_.

12

Correct Option

Solution :

12

Instruction length is 16, so, Maximum possible encodings =  $2^{16}$

It is given that there are 14 I-type instructions. Let's assume the maximum R-type instructions to be  $x$ .

Therefore,  $2^{16} \leq (14 \times 2^6 \times 2^4) + (x \times 2^6 \times 2^6)$

$$x \leq 12.5$$

So, maximum 12 R-type instructions possible.

QUESTION ANALYTICS



Q. 45

FAQ

Solution Video

Have any Doubt ?



Consider 1 GHz clock frequency processor, uses different operand accessing modes shown below:

Operand Addressing Mode	Frequency (@)
Register	10
Immediate	20
Direct	30
Memory indirect	20
Indexed	20

Assume that 2 cycles consumed for each memory reference, 3 cycles consumed for arithmetic computation and 1 cycle consumed when an operand is in register or instruction itself. What is the average operand fetch rate (in million operands/sec) of the processor

A 342.82

Correct Option

B 344.82

Solution :

(b)

Addressing Mode	Frequency	Cycles
Register	10	1
Immediate	20	1
Direct	30	2
Memory indirect	20	4
Indexed	20	$1(\text{reg}) + 3(\text{alu}) + 2(\text{mem}) = 6$

Average clocks per operand fetch =  $1 \times 0.1 + 1 \times 0.2 + 2 \times 0.3 + 2 \times 0.4 + 2 \times 0.6 = 2.9$

Average time per operand fetch =  $2.9 \times \text{Time period of 1 clock} = 2.9 \text{ ns}$

$$\text{Number of operand fetches in 1 sec} = \frac{10^9}{2.9} = \frac{1000 \times M}{2.9}$$

Operand fetches = 344.82 M operand fetches in 1 sec

C 355.82

D 346.82

QUESTION ANALYTICS



Q. 46

FAQ

Have any Doubt ?



Consider the following languages:

$L_1 = \{xy \mid x, y \in \{a+b\}^*, \#_a(x) = \#_a(y)\}$

$L_2 = \{xy \mid x, y \in \{a+b\}^*, \#_a(x) = \#_b(y)\}$

Let m be the number of states in the minimal DFA for  $L_1$  and let n be the number of states in the minimal DFA for  $L_2$ , then  $m - n$  is \_\_\_\_\_?

1

Correct Option

Solution :

1

$L_1$  is the set of all strings such that number of a's are even. Hence, minimal DFA for  $L_1$  has 2 states.

$L_2$  is  $\Sigma^*$ , hence, number of states in minimal DFA for  $L_2$  is 1. Hence,  $m - n = 1$ .

QUESTION ANALYTICS



Q. 47

Have any Doubt ?



Consider the language  $L$  of ALL palindromes over alphabet {a, b} that do not contain the substring aa. Which of the following statements are true for  $L$ ?

A  $L$  is regular.

B  $L$  is DCFL.

C  $L$  is CFL.

Correct Option

D The grammar  $S \rightarrow abSba?bSb?aba?a?b?$  generates  $L$ .

Correct Option

YOUR ANSWER - NA

CORRECT ANSWER - c,d

STATUS - SKIPPED

Solution :

(c, d)  
The grammar  $S \rightarrow abSba|bSb|aba|a|b$  generates  $L$  and  $L$  is CFL but not DCFL.

QUESTION ANALYTICS

+

Q. 48

? FAQ

Have any Doubt ?

Q

Given the following CFG grammar  $G = (\{S, A, B\}, S, \{a, b, x\}, P)$  with  $P$ :

- I.  $S \rightarrow A$
- II.  $S \rightarrow xb$
- III.  $A \rightarrow aAb$
- IV.  $A \rightarrow B$
- V.  $B \rightarrow x$

The grammar is \_\_\_\_\_.

A Both LL(1) and LR(0)

B Only LL(1)

C Only LR(0)

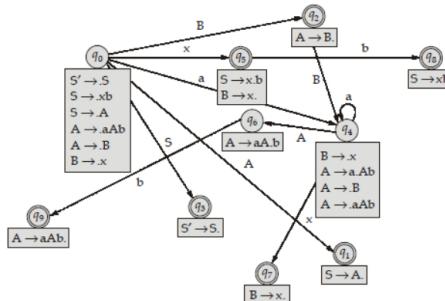
D Neither LL(1) or LR(0)

Correct Option

Solution :

(d)

It is easy to see that it is not LL(1). And for LR(0) part check following image. State 5 has S/R conflicts (even in case of SLR(1) leave case of LR(0)). So, it is not even SLR(1).



QUESTION ANALYTICS

+

Q. 49

Solution Video

Have any Doubt ?

Q

Find the solution to the following recurrence given that  $n$  is a power of 2.

$$T(n) = \begin{cases} 1 & n = 1 \\ 3T\left(\frac{n}{2}\right) + n & n > 1 \end{cases}$$

A  $T(n) = 3^{\log_2 n} - 2n$

B  $T(n) = 3 \times 3^{\log_2 n} - 2n$

Correct Option

Solution :  
(b)

$$\begin{aligned} T(n) &= 3 \left[ 3T\left(\frac{n}{2^2}\right) + \frac{n}{2} \right] + n \\ T(n) &= 3^2 T\left(\frac{n}{2^2}\right) + \frac{3^1}{2^1} + n + n \\ T(n) &= 3^2 \left[ 3T\left(\frac{n}{2^3}\right) + \frac{n}{2^3} \right] + \frac{3^1}{2^1} + n + n \\ T(n) &= 3^3 T\left(\frac{n}{2^3}\right) + \frac{3^2}{2^2} + n \frac{3^1}{2^1} + n + n \\ &\vdots \\ T(n) &= 3^k T\left(\frac{n}{2^k}\right) + \frac{3^{k-1}}{2^{k-1}} n + \dots + \frac{3^2}{2^2} n + \frac{3^1}{2^1} n + n \end{aligned}$$

Put,

$$\frac{n}{2^k} = 1$$

$\Rightarrow$

$$k = \log_2 n$$

$\Rightarrow$

$$T(n) = 3^{\log_2 n} + T(1) \left( \frac{3}{2} \right)^{\log_2 n - 1} + \dots + \frac{3^2}{2^2} n + \frac{3^1}{2^1} n + n$$

$$\begin{aligned}
 &\Rightarrow T(n) = 3^{\log_2 n} + \left(\frac{3}{2}\right)^{\log_2 n - 1} + \dots + \frac{3^2}{2^2}n + \frac{3^1}{2^1}n + \frac{3^0}{2^0}n \\
 &\Rightarrow T(n) = n \left[ \left(\frac{3}{2}\right)^0 + \left(\frac{3}{2}\right)^1 + \left(\frac{3}{2}\right)^2 + \dots + \left(\frac{3}{2}\right)^{\log_2 n - 1} + 3^{\log_2 n} \right] \\
 &\Rightarrow T(n) = n \left[ \left(\frac{3}{2}\right)^{\log_2 n + 1} - 1 \right] = 2n \left[ \left(\frac{3}{2}\right)^{\log_2 n + 1} - 1 \right] \\
 &\Rightarrow T(n) = 2n \frac{3^{\log_2 n} \cdot 3}{2^{\log_2 n} \cdot 2} - 2n \\
 &\Rightarrow T(n) = 3 \times 3^{\log_2 n} - 2n
 \end{aligned}$$

**C**  $T(n) = 2 \times 3^{\log_2 n} - 2n$

**D**  $T(n) = 3 \times 3^{\log_2 n} - 3n$

 QUESTION ANALYTICS



Q. 50

Solution Video

Have any Doubt ?



A certain moving arm disk-storage device has the following specifications:  
Number of tracks per surface = 404  
Track storage capacity = 130030 bytes  
Disk speed = 3600 rpm  
Average seek time = 30 m secs.  
What is the disk storage capacity and data transfer rate?

**A** 52532334 bytes,  $52532334 \times 60$  bytes/sec

**B** 52532002 bytes,  $52532002 \times 60$  bytes/sec

**C** 52532114 bytes,  $52532114 \times 60$  bytes/sec

**D** 52532120 bytes,  $52532120 \times 60$  bytes/sec

Correct Option

Solution :

(d)

$$\begin{aligned}
 \text{Disk storage capacity} &= \text{Track storage} \times \text{Number of tracks} \\
 &= 130030 \text{ B} \times 404 = 52532120 \text{ bytes} \\
 \text{Disk speed} &= 3600 \text{ RPM} \\
 1 \text{ round in } \frac{60}{3600} \text{ sec} \\
 \text{So in } \frac{1}{60} \text{ sec} &\rightarrow 52532120 \text{ bytes can be transferred.} \\
 \text{Data rate} &= 52532120 \times 60 \text{ bytes/sec}
 \end{aligned}$$

 QUESTION ANALYTICS



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SOLUTION REPORT

ALL(65)

CORRECT(0)

INCORRECT(0)

SKIPPED(65)

Q. 51

Solution Video

Have any Doubt ?



Assume the following relations:

BOOKS(DocId, Title, Publisher, Year)

STUDENTS(StdId, StdName, Major, Age)

Authors(AName, Address)

borrows(DocId, StdId, Date)

has-written(DocId, AName)

describes(DocId, Keyword)

The output of the following query is

 $\Pi_{\text{StdName}}(\sigma_{\text{Age} > 30}(\text{STUDENTS})) - \Pi_{\text{StdName}}(\sigma_{\text{Major} = 'CS'}(\text{STUDENTS}))$  A List the name of students who are older than 30 and who are studying CS. B List the name of students who are older than 30 or who are studying CS. C List the name of students who are older than 30 and who are not studying CS.

Correct Option

Solution :

(c)

The query returns the list of student names whose age are greater than 30 and removes all the students who are studying computer science. Resulting in list of students whose age are more than 30 and not studying computer science.

 D None of these

QUESTION ANALYTICS



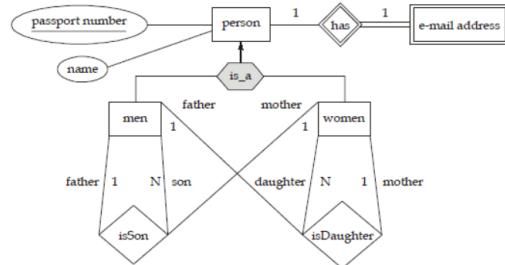
Q. 52

Solution Video

Have any Doubt ?



Consider the following entity-relationship (ER) model:



For the following groups of statements, pick the one that coincides best with the model.

 A Each E-mail address belongs to at least one person. B Each E-mail address belongs to at most one person. C Each E-mail address belongs to exactly one person.

Correct Option

Solution :

(c)

The E-mail entity is the weak entity of the has relationship, so it must participate in this relationship. Furthermore, the cardinalities restrict it to participate at most once (as with any weak entity).

 D None of the above is true

QUESTION ANALYTICS



Q. 53

FAQ

Solution Video

Have any Doubt ?

Consider a relation  $R(A, B)$  that contains  $r$  tuples and a relation  $S(B, C)$  that contains  $s$  tuples; assume  $r > 0$  and  $s > 0$ .

The maximum number of tuples that could be in the result of the following expression.

 $\pi_B(R) - (\pi_B(R) - \pi_B(S))$  A  $\max(r, s)$  B  $\min(r, s)$  C 0 D

Correct Option

**Solution :**

(d)

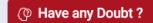
The maximum tuples will be  $R$  only when everything on right will be 0. Therefore, the correct answer will be  $R$ .

Correct Option

 QUESTION ANALYTICS



**Q. 54**





The number of different ways 100 people can be arranged in the seats in a classroom that has exactly 100 seats, is Y! What is Y?

 100

Correct Option

**Solution :**

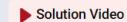
100

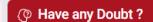
Each seating is simply an ordering of the people. Thus the answer is 100!

 QUESTION ANALYTICS



**Q. 55**







Consider a parent process that has forked a child in the code snippet below:

```
int count = 0;
ret = fork();
if (ret == 0);
printf("count in child = %d\n", count);
else {
    count = 1;
}
```

The parent executes the statement "count = 1" before the child executes for the first time. Now, what is the value of count printed by the code above? Assume that the OS implements a regular fork (not a copy-on-write fork).

 0

Correct Option

**Solution :**

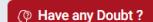
0

0 (the child has its own copy of the variable).

 QUESTION ANALYTICS



**Q. 56**





What is the output of the following program?

```
#include <stdio.h>
int fun(char *S1)
{
    char *S2 = S1;
    while(*++S1);
    return (S1 - S2);
}
int main()
{
    char *s = "CRACKGATE";
    printf("%d", fun(s));
    return 0;
}
```

 9

Correct Option

**Solution :**

9

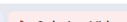
"while(\*++S<sub>1</sub>);" this statement will run until S<sub>1</sub> points to the null at the end of the string. So, when "while(\*++S<sub>1</sub>);" stops, S<sub>1</sub> will have the value that is the address of null at the end of the string. S<sub>2</sub> points to the base of the string, so, S<sub>1</sub> - S<sub>2</sub> will return the number of characters of the string which is 9.

 QUESTION ANALYTICS



**Q. 57**









Consider given recursive algo:

```
Algo rec(n)
{
    if (n ≤ 2)
        return (1)
    else
        return ((rec $\sqrt{n}$ ) + (rec $\sqrt{n}$ ) + log n)
```

Consider the following statements:  
 I.  $\text{rec}(n)$  is  $\Theta(\log n)$   
 II. Value return by the  $\text{rec}(n)$  is  $\Theta(\log n \cdot \log \log n)$   
 III. Time complexity of  $\text{rec}(n)$  is  $\Theta(\log n \cdot \log \log n)$   
 IV. Space complexity of  $\text{rec}(n)$  is  $\Theta(\log n)$

Which of the following is true?

A I and IV only

B II and III only

C II and IV only

D I and II only

Correct Option

Solution :  
(d)

#### QUESTION ANALYTICS

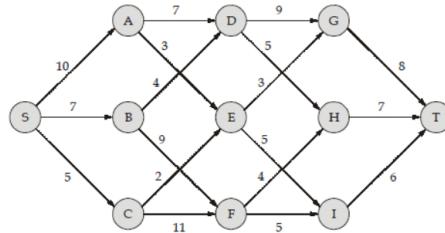
Q. 58

Solution Video

Have any Doubt ?



Given a multistage graph  $G$  as given below. Let the cost of the minimum path from  $S$  to  $T$  be  $P$  and the number of minimum cost paths from source  $S$  to destination  $T$  be  $Q$ . What is  $P \times Q$ ?



36

Correct Option

Solution :  
36  
The minimum cost paths are SCEGT, SCEIT  
 $P$  is 18 and  $Q$  is 2.  $P \times Q = 18 \times 2 = 36$ .

#### QUESTION ANALYTICS

Q. 59

Solution Video

Have any Doubt ?



Consider a system where the input goes through a 4 bit ring counter followed by 4 bit Johnson counter followed by decade counter. If the input frequency applied to given system is 1600 KHz then the output frequency will be \_\_\_\_\_ KHz.

5

Correct Option

Solution :  
5  
Ring mod 4 Johnson mod 8 decade counter mode 10 total  $4 \times 8 \times 10 = 320$

$$\frac{1600}{320} = 5 \text{ KHz}$$

#### QUESTION ANALYTICS

Q. 60

? FAQ Have any Doubt ?



Which of the following are INCORRECT?

$S_1$  : While running DFS on a directed graph, if from vertex  $u$  we visit a finished vertex  $v$ , then the edge  $(u, v)$  is a cross-edge.

$S_2$  : Changing the RELAX function to update if  $d[v] \geq d[u] + w(u, v)$  (instead of strictly greater than) may produce different shortest paths, but will not affect the correctness of the Bellman-Ford outputs (distance  $d$  and parent  $\Pi$ ).

$S_3$  : If a weighted directed graph  $G$  is known to have no shortest paths longer than  $k$  edges, then it suffices to run Bellman-Ford for only  $k$  passes in order to solve the single-source shortest paths problem on  $G$ .

$S_4$  : If a topological sort exists for the vertices in a directed graph, then a DFS on the graph will produce no back edges.

A  $S_1$  only

Correct Option

B  $S_2$  only

Correct Option

C  $S_3$  only

D  $S_4$  only

YOUR ANSWER - NA

CORRECT ANSWER - a,b

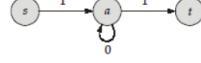
STATUS - SKIPPED

**Solution :**

(a, b)

$S_1$  : False. The edge could be either a cross-edge or a forward edge. The edge cannot be a back edge-a back edge goes to a vertex that has started, but not finished.

$S_2$  : False. The parent pointers may not lead back to the source node if a zero-length cycle exists. In the example below, relaxing the  $(s, a)$  edge will set  $d[a] = 1$  and  $\Pi[a] = s$ . Then, relaxing the  $(a, a)$  edge will set  $d[a] = 1$  and  $\Pi[a] = a$ . Following the  $\Pi$  pointers from  $t$  will no longer give a path to  $s$ , so the algorithm is incorrect.



$S_3$  : True. The  $i^{\text{th}}$  iteration finds shortest paths in  $G$  of  $i$  or fewer edges, by the path relaxation property.

$S_4$  : True. Both parts of the statement hold if and only if the graph is acyclic.

QUESTION ANALYTICS

+

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## FULL SYLLABUS TEST-8 (ADVANCE LEVEL) (GATE - 2021) - REPORTS

[OVERALL ANALYSIS](#)   [COMPARISON REPORT](#)   **SOLUTION REPORT**
[ALL\(65\)](#)   [CORRECT\(0\)](#)   [INCORRECT\(0\)](#)   [SKIPPED\(65\)](#)
**Q. 61**
[▶ Solution Video](#)
[Have any Doubt ?](#)


Byte addressable main memory having 216 bytes. 2-way set associative data cache containing lines of 100 byte each. An  $80 \times 80$  2-D array is stored in main memory, starting at  $1100H$ . Assume cache is initially empty and the element size of array is one byte. Total number of misses if array is accessed completely starting from the first element which is at memory location  $1100H$ ?

**64**
[Correct Option](#)
**Solution :**

64

Each block has size 100 bytes and hence 100 elements can be fetched in single transfer.

Now, do some smart work here. Rather than drawing the mapping and analysing think that array is contiguously allocated. Also that the array is starting from  $1100$ , which is the first word of corresponding block. So, whichever line the first element of the array will be mapped to, there will be 1 cache miss for each new block transferred from main memory. Also, since array is accessed only once so no complications of which cache line will be retained in multiple iterations. Hence, number of misses will be equal to number of blocks required to store the array.

$$\frac{80 \times 80}{100} = 64$$

[QUESTION ANALYTICS](#)

**Q. 62**
[FAQ](#)
[▶ Solution Video](#)
[Have any Doubt ?](#)


Consider the following grammar  $G_1$ ,  $G_2$  and  $G_3$ :

$G_1 : S \rightarrow 0S1 \mid 1S0 \mid SS \in$

$G_2 : S \rightarrow 0S1S \mid 1S0S \mid \epsilon$

$G_3 : S \rightarrow 0S1S \mid S1S0 \mid \epsilon$

Which of the following are true?

**A**  $G_1$  and  $G_2$  are equivalent.

[Correct Option](#)
**B**  $G_1$  and  $G_3$  are equivalent.

**C**  $G_1$ ,  $G_2$  and  $G_3$  are equivalent.

**D**  $L(G_1) = \{w \mid w \text{ has equal number of } 0\text{'s and } 1\text{'s}\}$ 
[Correct Option](#)

YOUR ANSWER - NA

CORRECT ANSWER - a,d

STATUS - SKIPPED

**Solution :**

(a,d)

$G_1$  and  $G_3$  are not equivalent because " $1001$ "  $\in L(G_1)$  and " $1001$ "  $\notin L(G_3)$ .

[QUESTION ANALYTICS](#)

**Q. 63**
[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)

Implicit 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. 64

[FAQ](#)
[Have any Doubt?](#)

A 20 Kbps Satellite link has a propagation delay of 400 ms. The transmitter employs the "go-back-n ARQ" scheme with n set to 10. Assuming that each frame is 100 bytes long, what is the efficiency of channel? (With 2 decimal places)

 0.47 (0.47 - 0.48)

Correct Option

**Solution :**  
 0.47 (0.47 - 0.48)

$$\text{Transmission time} = \frac{\text{Data size}}{\text{BW}} = 40 \text{ ms}$$

 $\text{Propagation time} = 400 \text{ ms}$ 

$$a = \frac{T_p}{T_t} = \frac{400}{40} = 10$$

$$\text{Maximum window size of 100% efficiency} = \frac{W_s}{1+2a}$$

$$\text{Efficiency} = \frac{10}{(1+2\times 10)} = 0.4761 = 47.61\%$$

 QUESTION ANALYTICS

+

Q. 65

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

Consider the following statements about Optimal (OPT) and Least Recently Used LRU) page replacement algorithms.

(S is for string reference and  $S^R$  is reverse reference string )

I. The page fault rate for the OPT algorithm on S is the same as the page fault rate for the OPT algorithm on  $S^R$ .

II. The page fault rate for the LRU algorithm on S is the same as the page fault rate for the LRU algorithm on  $S^R$ .

Which of the above statements are correct?

 A I only

 B II only

 C Both I and II

Correct Option

**Solution :**

(c)

Both the statements are true. If we let  $S^R$  be the reverse of a reference string S, then the page fault rate for the OPT algorithm on S is the same as the page fault rate for the OPT algorithm on  $S^R$ . Similarly, the page fault rate for the LRU algorithm on S is the same as the page fault rate for the LRU algorithm on  $S^R$ .

 D None of these

 QUESTION ANALYTICS

+

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