GATE CS 2019 Questions & Solutions

• 10 Full 1

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GA Section

1 Marks:

Q. The expenditure of project _____ as follows:
Equipments - 20 lakh.
Salary - 12 lakhs.
A. Breaks
C. Break down
B. Break
D. Breaks down

(Memory Based)

(Memory Based)

(Memory Based)

Ans. D.

- Q. What court is to Judge _____ is to Teacher.
 - A. a School
 - B. a Syllabus
 - C. a Punishment
 - D. a Student

Ans. A.

Q. Ten friends decided to give a gift to teacher by dividing the total amount. If two of them decided not to give, then each of them has to give Rs. 150 more. What was the total amount?
 A 6000
 B 12000

A. 6000	B. 12000
C. 666	D. 3000

Ans. A.

Let total amount be x

If all ten given the gift, then share of each = $\frac{x}{10}$

If 8 gives the gift, then share of each = x/8According to given condition

$$\frac{x}{8} = \frac{x}{10} + 150$$
$$\frac{x}{8} - \frac{x}{10} = 150$$
$$\frac{5x - 4x}{40} = 150$$
$$\frac{x}{40} = 150$$
$$\Rightarrow x = 40 \times 1$$
$$x = 6000$$

Q. Two cars started moving in same direction from same point with speeds 50 km/h and 60 km/h respectively. Then after how many hours from starting, the distance between then will be 20 km?

Α.	1 hr	B. 3 hrs
C.	2 hrs	D. 6 hrs

50

(Memory Based)

Ans. C.

Let two cars be A and B moving with speeds 50 km/h and 60 km/h respectively and let the time taken be 't' hours after which the distance between them will be 20 kms. So, distance travelled by A in 't' hours = 50 t kms

And distance travelled by B in 't' hours = 60 t kms So, 60 t - 50 t = 20 \Rightarrow 10t = 20 or t = 2 hrs



Q. The search Engine model _____ around the fulcrum of trust.

A. Revolves	B. Plays
C Burct	D Sinks

C. Burst D. Sinks

(Memory Based)

Sol. C.

Suppose statement IV is true. All other is false What S rays is true P says \rightarrow Q committed crime \rightarrow false. Hence Q not committed. Q says \rightarrow S committed crime false \rightarrow Hence S not committed only crime R says \rightarrow I dinn't do that \rightarrow false. Hence, R is criminal S says \rightarrow What Q says about me is false Hence validated \Rightarrow R is criminal

2 Marks:

Q. Triangle is Teacher, Rectangle is Administrator and circle is Researcher. Then the percentage of Administrator is in range of



A. 0 – 15	B. 16 – 30
C. 31 – 46	D. 47 – 60

(Memory Based)

Ans. C.

Total people = Teachers + Administrators + Researchers 80 + 20 + 60 = 160Administrators = 20+20+10 = 50Percentage = $50/160 \times 100 = 31.25\%$

Q. Police arrested P, Q, R, S \rightarrow 4 criminals. All of them know each other.

- I. P says "Q committed crime"
 - II. Q says " S committed crime"
 - III. R says " I didn't do that"
 - IV. S says what Q says about me is false"

If only one statement is correct, then who is the criminal?

- A. P B. Q
- C. R D. S

(Memory Based)

Ans. A.



CS Section

1 Marks:

Q. Given Grammar $S' \rightarrow S$ $S \rightarrow \langle L \rangle / id$ $L \rightarrow L, S/S$ Let $I_0 = closure (\{[S' \rightarrow \bullet S]\})$ The number of items in Goto (I_0 , <) in

Ans. 5

Sol.

Io	$\begin{array}{c} S' \rightarrow \cdot S \\ S \rightarrow \cdot < I \end{array}$	Goto (Io,<)	$S \rightarrow \langle \cdot L \rangle$	
	$S \rightarrow \cdot < L >$ $S \rightarrow \cdot id$		$L \to \cdot L, S$ $L \to \cdot S$	
			$S \rightarrow \cdot $ $S \rightarrow \cdot id$	

- Q. Derivation used in LR parserA. Leftmost in reverseC. Rightmost
- B. Leftmost
- D. Rightmost in reverse

(Memory Based)

(Memory Based)

Ans. A

- Sol. Leftmost derivation in reverse is done Hence A is correct
- Q. If 15 computers are to be connected using 8 port ethernet switches, then the minimum number of switches required are _____

(Memory Based)

Ans.

Sol. one port for network connection, remaining part = 7

 $\frac{15}{7} = 2.14$

Q. Given IP = 100.10.5.2, 100.10.5.4, 100.10.5.6 and subnet mask 255.255.255.252 which of the IPs are in same network?

(Memory Based)

Ans.

- Sol. $100.10.5.2 \Rightarrow \text{Net is} \Rightarrow 100.10.5.0$ $100.10.5.4 \Rightarrow \text{Net id} \Rightarrow 100.10.5.4$ $100.10.5.6 \Rightarrow \text{Net id} \Rightarrow 100.10.5.4$ Hence $100.10.5.4 \ 2 \ 100.10.5.6 \ will be on same network$ Q. Pair of protocols used to send & retrieve email (in that order) A. IMAP, POP3 B. IMAP, SMTP C. SMTP, POP3 D. SMTP, MIME (Memory Based) Ans. C Sol. IMAP \rightarrow Internet Message Access protocol (store and view)
- (store and view) POP3 \rightarrow Post Office Protocol (retrieve email) SMTP \rightarrow Simple Mail Transfer Protocol (send Email) MIME \rightarrow Multi purpose Internet Mail Extensions (For media)



Q. Given Statement.

I. Strict 2 - Phase lock protocol generate Conflict Serializable schedule that are also recoverable

II. Time stamp - ordering concurrency control protocol with Thomas write rule can generate view serialized schedule that are not conflict serializable which are True?

A. Only I

C. Both True

B. Only II D. Both are false

(Memory Based)

(Memory Based)

G is undirected graph n-vertices where $n \ge 2$, then find the number of different Q. Hamiltonian cycle in G.

Ans. $\frac{(n-1)!}{2}$ Option D.

The value of 3⁵¹ mod 5 is _____ Q.

(Memory Based)

- Ans. 2
- Sol. 3⁵¹ mod 5
 - $= (3^3)^{17} \mod 5$
 - $= (2^7)^{17} \mod 5$
 - $= (2)^{17} \mod 5$
 - $= (2)^{16} \cdot 2 \mod 5$
 - $= (2^4)^4 \cdot 2 \mod 5$
 - $= (16)^4 \cdot \text{mod } 5 \cdot 2 \mod 5$
 - $= 1 \mod 5 \cdot 2 \mod 5$
 - = 2
- Q. Given : A set S with elements {1, 2, 3, 4,.... 13}. 2 number are chosen randomly from this set what will be the probability that 2 numbers chosen will have the same MSB in binary representation?

- Ans. 0.4615
- Sol. $1 \rightarrow 0001$ $2 \rightarrow 0010$
 - $3 \rightarrow 0011$
 - $4 \rightarrow 0100$
 - $5 \rightarrow 0101$
 - $6 \rightarrow 0110$
 - $7 \rightarrow 0111$
 - $8 \rightarrow 1000$
 - $9 \rightarrow 1001$
 - $10 \rightarrow 1010$
 - $11 \rightarrow 1011$
 - $12 \rightarrow 1100$
 - 13
 ightarrow 1101

$$\frac{(\mathsf{MSB} \rightarrow 0) + (\mathsf{MSB} \rightarrow 1)}{13}$$

$$\frac{C_2 + {}^6C_2}{{}^{13}C_2} = 0.4615$$



Q. include < studio h>
 Int r()
 {
 static int num = 7;
 return num - -;
 }
 int main ()
 {
 for (r(); r() ; r ())
 Print f (``%d'', r ());
 return 0;
 }

(Memory Based)

Sol. Static variable value will be initialized only at the time of compilation.

```
\begin{bmatrix} 7 \\ \\ num \end{bmatrix}→Hence execute it.

Expected Answer 52

int jumble (int x, int y)

{

    x = 2. x + y;

    return x;

}

main ()

{ int x = 2, y = 5;

y = jumble (y, x)

x = jumble (y, x)

Pf (" %d ", x)

return
```

(Memory Based)

(Memory Based)

- Sol. It is call by value, y = 5, x = 2 y =jumble (5, 2) = 12Now, x = 2 y = 12 x =jumble (12, 2) = 26Hence, 26 will be printed Expected Answer 26
- Q. Given Z = X Y. What X, Y, Z are all sign-magnitude from X and Y are represented in n-bits. To avoid overflow Z would be required?
 A. n + 1
 B. n + 2
 C. n 1
 D. n

Ans. A.

}

Q.

With n + 1 number of bits, there will not be overflow for either addition or subtraction of two n-bits number.

Q. Three process sharing the given variable

D = 100,

P1	P2	Р3
D = D+20	D = D-50	D = D+10

Process exited on uniprocessor system running in time – shared operating system. If the min & max possible value of D after these process have Completed execution are x y . then y -x is



- Sol. Each statements is executed in 3 step
 - 1. Read D
 - 2. Increment D
 - 3. Write D
 - Hence, the maximum value will be 130 &d min value will be 50
 - ∴ y x = 80
- Q. The given program
 include <stdio.h>
 main ()
 {
 int i;
 For (i = 0; i<10; i + +)
 If (i%2 = = 0) fork ()
 return 0;
 }
 </pre>

Find the total child Process?

(Memory Based)

Sol. I = 0

Fork () Fork will be called 5 times \Rightarrow n = 5 No of child process = 2n-1 = 31

Q. An array of 25 elements is sorted using quicksort. Pivot element is chosen randomly. What is the Probability of pivot element gets placed in worst possible condition in first round?

(Memory Based)

Sol. In worst case Element may be placed at I or cost position caring a biased – array situation. Hence 1/25 + 1/25 = 2/25

2 Marks:

Q. In an RSA system n = 3007 and f(n) = 2880 where f is the Euler's totient function of n. What is the prime factor of n which is greater than 50? (Memory Based)

Ans. 96

Sol. n = 3007 F(n) = 2880 \rightarrow f (n) = (p - 1) (q - 1) Where p, q are prime factor of n n = 3007 * 31*97 \Rightarrow prime factor greater than 50 is 96 Given the functional dependencies Q. $OR \rightarrow S$ $R \rightarrow P$ $S \rightarrow Q$ They are decomposed into 2 functional dependencies Y (PR) and Z (QRS). Which of the following statements is/are true S₁: Y and Z are in BCNF S₂: Y and Z are both dependency preserving and lossless decompositions A. S₁ only B. S₂ only C. Both are true D. Neither are true



Sol.

R (P,Q,R,S) $Y(P\underline{R}) \qquad Z(Q\underline{R}S)$ $R \rightarrow P \qquad QR \rightarrow S \{QR, SR\}$ $S \rightarrow Q$ R (P,Q,R,S) \bigcup $Decomposed (Y(P\underline{R}) \ Z(QRS))$ $R \rightarrow P \quad QR \rightarrow S$ $S \rightarrow Q$ $Primary \{R\} \qquad Primary - \{QR\}$

Primary {R}Primary $= \{QR\}$ Key \Downarrow BCNFHence it is notin BCNF

Hence S_1 is false but $\{R\}$ which is Common in both table act as primary key in Y Hence it is lossless & DP. S_2 is true

- Q. Which of the following is not correct for B+ Tree Creation used for creating and index of RDBMS table
 - A. Each leaf made has pointer to next leaf
 - B. B+ Tree in height balance Tree
 - C. Key Volume in Each node Kept in Sorted
 - D. Non leaf have pointer data record

(Memory Based)

Ans. D

- Sol. B+ Tree \rightarrow
 - A) Correct
 - B) Yes, height balanced
 - C) Yes Key Values are sorted D) Non leaf stores only pointer to leaf nodes Leaf node stores data pointer
 - Hence D is right option
- Q. Which of the following is not CFL ? A. L = {WW^R, W \in {0, 1}*, n \ge 0} B. L={WaⁿbⁿW^R ; W \in (0, 1)* n \ge 0} C. L={WaⁿW^Rbⁿ ; W \in (0, 1)*, n \ge 0} D. L = {aⁿbⁱ ; i = <n, 3n, 5n, 7n >, n \ge 0}

(Memory Based)

Ans. C

- Sol. (A) WWR \rightarrow can be done using stack hence CFL (B) WanbnWR \rightarrow Push W Push aⁿ Popⁿ for bⁿ Pop W for W^R Can be done using stack Hence CFL
 - (C) Cannot be done using stack, hence not CFL
 - (D) Can be done using stack, hence CFL



Q. L is regular grammar over $\Sigma = (a, b)$. Find which one is not regular. A. $L \cdot L^{R} = (xy \mid x \in L, y^{R} \in L)$ B. Suffix(L) = $(y \in \Sigma^{x} \mid \exists x E^{x} x y \in L)$ C. Prefix(L) = $(y \in \Sigma^{x} \mid \exists x E^{x} x y \in L)$ D. WW^R | W $\in L$ (Memory Based)

Ans. D

- Sol. (A) $L \rightarrow$ Regular grammar (B) Regular LR \rightarrow Also regular grammar (C) Regular $\rightarrow L \cdot L^R \rightarrow$ Regular (D) WW^R is not regular Hence D is correct.
- Q. Consider the following snapshot of a system running n processes. Process i is holding X_i instances of a resource R, 1 < = 1 < = n. Currently, all instances of R are occupied. Further, for all i, process i has placed a request for an additional Y_i instances while holding the X_i instance it already has. There are exactly two processes p and q such that $Y_p = Y_q = 0$. What condition will make sure only X_p and X_q are executed.

(Memory Based)

Ans. $X_p + X_q < \min$

Sol.

 P_1 P₂ Pn X_1 X2 Xn X_1 Y_2 Yn Only X_p and X_q $X_p + X_q < \min(Y_k)$ 1 <u><</u> k <u><</u> n & k! = p & k ! n $(Y_k : 1 < = k < = n, k! = p, k! = q)$

Q. There are 3-process given. Each value for arrival time and burst time is given in milisecond. Find the Z value if waiting time in 1 milisecond.

Process	A.T	B.T
P1	0	3
P ₂	1	1
P ₃	3	3
P4	4	2

Ans.	7	=	3
A113.	~	_	5

Sol. Three cases

> 3				
P ₂	P	ı P	P ₃ P ₄	
L	2	4	7 Z+7	
P ₂	P ₃	P4		
0	1	3		
$=\frac{5}{4}$	=1 H	lence	e not possible	
P ₂	P ₁	P ₄	P ₃	
0 L 2 4 4+2 4+2+3				
т.			_	
P2	P3	P4		
0	Ζ	0		
	$\begin{array}{c c} 3 \\ \hline P_2 \\ 0 \\ \hline S_4 \\ \hline S_4 \\ \hline S_4 \\ \hline P_2 \\ \hline 0 \\ \hline P_2 \\ \hline \hline 0 \\ \hline P_2 \\ \hline \hline 0 \\ \hline \hline P_2 \\ \hline \hline 0 \\ \hline \hline P_2 \\ \hline \hline 0 \\ \hline \hline \hline P_2 \\ \hline \hline \hline 0 \\ \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline \hline \hline P_2 \\ \hline \hline \hline \hline \hline \hline \hline \hline P_2 \\ \hline P_2 \\ \hline \hline$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	



(Memory Based)



The absolute value of product of eigen value of R is

Ans. 12

		[1	2	4	8]		
~ .	_	1	3	9	27	,		
501.	K =	1	4	16	64			
		1	5	25	12	5		
	R2 =	– ⇒ R∶	- c	R₁		_		
	R3 =	⇒ R:	3 —	R_1				
	R4 =	⇒ R	4 -	R1				
		[1	2	4	8]		
	Р	0	1	5	19			
	К=	0	2	12	56	;		
		0	3	21	11	7		
	R3 =	⇒ R:	3 — 3	2R2				
	$R_4 \Rightarrow R_4 - 3R_2$							
		[1	2	4	8			
	п	0	1	5	19			
	к=	0	0	2	18			
		0	0	6	60			
Now calculate determ						nina	nt	
	$= 1 \times 1 (2 \times 60 - 18 \times 6)$						6)	
	= 1	20	- 10	08 =	12			
	lim	۱ م	x	⁴ – 8	1			
Q.	$x \rightarrow$	• 3 ·	2x ²	- 5x	-3			
					-			

٨	108	
Α.	7	
\sim	53	
с.	12	

B. Limit not exist

D. 1

(Memory Based)

Sol. $\lim_{x \to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$

Q.

2

 ϕ

sum

4 6 8 10

1000 1002 1004 1006 1008

 ϕ

i



$$\Rightarrow \lim_{x \to 3} \frac{(x^2)^2 - (9)^2}{2x^2 - 6x + x - 3} \Rightarrow \lim_{x \to 3} \frac{(x^2 - 9) - (x^2 + 9)}{(2x + 1)(x - 3)} \Rightarrow \lim_{x \to 3} \frac{(x + 3)(x - 3)(x^2 + 9)}{(2x + 1)(x - 3)} = \frac{(3 + 3)(18)}{7} = \frac{18 \times 6}{7} = \frac{108}{7} Q. # include < stdio h > int main () { int arr [] = {2, 4, 6, 8, 10}int sum = 0, i, *b = arr + 4;for (i = 0, i < 5, i + +) { sum = sum + (*b - i) - * (b - i); } print of (``%d\n", sum);return 0; }Sol. Ans. 10 0 1 2 3 4$$

(Memory Based)

```
Sum = 0 + 9 - 8 = 1
     Sum = 1 + 8 - 6 = 3
     Sum = 3 + 7 - 4 = 6
     Sum = 6 + 6 - 2 = 10
Q.
     How many times sum will be printed?
     int main ()
     {
     float sum = 0.0, j = 1.0, i = 2.0
     while (i/j > 0.0625)
     {
     j = j + j;
     sum = sum + i/j
     print f ("% f n", sum)
     return 0;
     }
```

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b

Sol. Loop will run till i/j > 0.0625in each iteration



j + j + j = 2j and i remain fix. $i/j > 0.0625 \Rightarrow \frac{i}{0.0625} > i \Rightarrow j < 32$ initially j = 2 \Rightarrow it will take 5 iteration to become j = 32. Hence sum will be printed five times. Q. # include < stdio h> void convert [int n] If (n < 0){ } else { convert (n/2); print t (``%d \n", n); } What will be the output when convert is called by passing a positive integer (n > 0)(Memory Based) Sol. $con(n) \rightarrow con(n/2) \rightarrow con(n2^2)$ Go to infinite loop with no output Q. 16 bit 2's compliment representation in sign magnitude form of -28 is A. 1111 1111 1110 0100 B. 1101 1100 1101 0000 C. 1111 1111 1111 1100 D. 1111 1111 1110 0100 (Memory Based) Ans. D. $+28 \longrightarrow 011100$ 1's compliment \longrightarrow 100011 +12's compliment \longrightarrow 100100 To represent it as a 16 bit number we copy MSB bit and paste it to the left side. \therefore 16 bit representation will be 1111 1111 1110 0100 Q. Which of the following logic is invalid A. $\mathbf{X} \oplus \mathbf{Y} = (\mathbf{X}\mathbf{Y} + \mathbf{X'}\mathbf{Y'})'$ B. $X \oplus Y = X + Y$ if XY = 0C. $\mathbf{X} + (\mathbf{Y} \oplus \mathbf{Z}) = (\mathbf{X} \oplus \mathbf{Y}) + \mathbf{Z}$ D. $(\mathbf{X} \oplus \mathbf{Y}) \oplus \mathbf{Z} = \mathbf{X} \oplus (\mathbf{Y} \oplus \mathbf{Z})$ (Memory Based) Ans. C. $X \oplus Y = XY' + X'y$ a) $(XY + X'Y')' = (X_{NOR})' = XOR$ b) If XY = 0, that implies X = 0, Y = 1; $X \oplus Y = 1 = X + Y$ $X = 1, Y = 0, X \oplus Y = 1 = X + Y$ $X = 0, Y = 0; X \oplus Y = 0 = X + Y$ c) $X + (Y \oplus Z) = X + Y'Z + YZ'$ LHS Not same $(X \oplus Y) + Z = XY' + X'Y + Z$ RHS d) XOR is associative

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