

## GATE 2021 Examination\* (Memory Based)

## Computer Science Engineering

Test Date: 13<sup>th</sup> Feb 2021

Test Time: 09:30 am to 12:30 pm

Stream Name: Computer Science Engineering

## General Aptitude

1. If the ratio of boys and girls in a class is 7:3. Then which of the values possibly be the total number of students.
- (A) 50  
(B) 21  
(C) 37  
(D) 73

**[Ans. A]**

2. We have two rectangular sheet paper M and N of dimension  $6\text{ cm} \times 1\text{ cm}$  each sheets is rolled to form an open cylinder by bringing two short edges of the sheet together. Sheet N is cut into equal square patches and assembled to form the largest possible closed cube. Assuming the ends of cylinder are closed the ratio of the volume of the cylinder to that of cube is
- (A)  $3/\pi$   
(B)  $9/\pi$   
(C)  $3\pi$   
(D)  $\pi/2$

**[Ans. B]**

3. There are five bags each containing identical sets of ten distinct chocolates. One chocolate is picked from each bag probability that at least two chocolate are identical is \_\_\_\_\_.
- (A) 0.6976  
(B) 0.3024  
(C) 0.4235  
(D) 0.8125

**[Ans. A]**



4. (i) Everybody in the class is prepared for the exam.  
(ii) Baby invited Danish to his home because he enjoys playing chess  
Which is correct observation about the two
- (A) (i) is grammatically correct (ii) is unambiguous  
(B) (ii) grammatically correct (ii) ambiguous  
(C) (i) grammatically incorrect (ii) ambiguous  
(D) (i) grammatically incorrect (ii) unambiguous

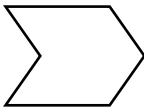
**[Ans. B]**

5. \_\_\_\_\_ is to surgery as writer is to \_\_\_\_\_  
Which of the following option maintains a similar logical relation in above sentence.
- (A) medicine, grammar  
(B) hospital, library  
(C) plan, outline  
(D) doctor, books

**[Ans. D]**

6. A polygon is convex if, for every pair of points, P & Q belonging to the polygon. The line segment PQ lies completely inside or on the polygon.  
Which one of the following is not a convex polygon?

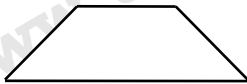
(A)



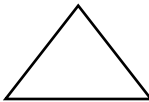
(B)



(C)



(D)



**[Ans. A]**



7.

Item	Cost	Profit	M.P
P	5400	-	5860
Q	-	25	10000

Statistics of cost of item P to cost of Q is 3: 4 discount is calculated as the difference between M.P & S.P. the profit percentage is calculated as the ratio of the difference between S.P and cost to the cost (profit % =  $\frac{S.P - \text{cost}}{\text{cost}} \times 100$ ) the discount on item Q, as a percentage of its marked price is \_\_\_\_\_.

- (A) 12.5  
 (B) 10  
 (C) 25  
 (D) 5

[Ans. B]

8. All bacteria are micro \_\_\_\_\_.

Given below two statements 1 &amp; 2 and two conclusions I, II

S1: All bacteria are micro organisms

S2: All pathogens are micro organisms

CI: Some pathogens are bacteria

CII: All pathogens are not bacteria

Based on the above statements and conclusions, which one of the following option is logically correct?

- (A) Only conclusion II is correct  
 (B) Only conclusion I is correct  
 (C) Either conclusion I or II is correct  
 (D) Neither conclusion I nor II is correct

[Ans. C]

### Technical

1.  $\lim_{x \rightarrow -3} \frac{\sqrt{2x+22} - 4}{x+3}$   
 (rounded to two decimal places)

[Ans.\*] Range: 0.25 to 0.25

2. Given  $[A] = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$

Largest eigen value of the matrix is \_\_\_\_\_.

[Ans.\*] Range: 3 to 3



3. Representation of a number in base 3 is 210. What is its hexa decimal representation?"

**[Ans. \*] Range: 15 to 15**

4. A graph  $g$  contains 8 vertices, and 5 faces find the number of edges?

**[Ans. \*] Range: 11 to 11**

5. "G is group with order 8.

H is subgroup of G

$1 \leq |H| \leq 6$  then which is true

- (A) Both G and H cyclic  
 (B) G cyclic H not cyclic  
 (C) G not cyclic H cyclic  
 (D) None cyclic

**[Ans. C]**

6. Consider 3 process A, B, C all arrived at time zero, with respective burst time 10, 20, 16. The average waiting time with non-Preemptive SJF S

**[Ans. \*] Range: 12 to 12**

7. True or False

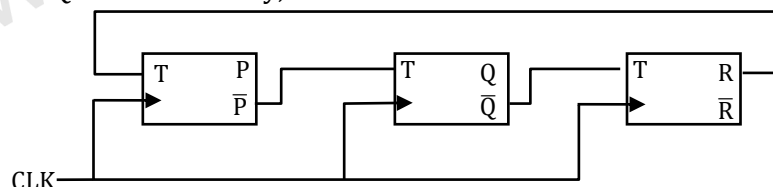
1. The SLR (1) grammars are unambiguous and there are some unambiguous grammars which are not SLR (1)

2. There exist at most  $O(n^3)$  algorithm to parse the CFG grammar sat

- (A) 1 and 2 both are true  
 (B) Only 1 is true  
 (C) Only 2 is true  
 (D) Neither 1 nor 2 is true

**[Ans. A]**

8. If PQR = 000 initially, then what are the next three states?



**[Ans. \*] 011, 101, 000**

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9. Suppose a database system crashes again while recovering from a previous crash. Assume check pointing is not done by the database either during transaction or during recovery. Which of the following are true?
- (A) System can recover any further
  - (B) The same undo and redo list will be used while recovering again
  - (C) All the transaction that are already undone and redone will not be recovered again
  - (D) the database will become inconsistent

[Ans. B]

9. Let  $r_i(Z)$  and  $w_i(Z)$  denotes read/write operations respectively on a data item  $Z$  by a transaction  $T_i$ . Consider the following 2 schedule.

$S_1: r_1(X)r_1(Y)r_2(X)r_2(Y)w_2(Y)w_1(X)$

$S_2: r_1(X)r_2(X)r_2(Y)w_2(Y)r_1(Y)w_1(X)$

- (A)  $S_1$  and  $S_2$  are non-conflict serializable
- (B)  $S_1$  and  $S_2$  are conflict serializable
- (C)  $S_1$  is conflict serializable and  $S_2$  is non-conflict serializable
- (D)  $S_1$  is non-conflict serializable and  $S_2$  is conflict serializable

[Ans. D]

10. A relation  $r(A, B)$  in a relational database has 1200 tuples. The attributes  $A$  has integer values ranging from 6 to 20 and the attribute  $B$  has integer values ranging from 1 to 20. Assume that the attributes  $A$  and  $B$  are independently distributed. The estimated number of tuples in output of  $\sigma_{(A>10) \text{ or } (B=18)} r$

11. Consider the following relation or  $R, P, Q, S, T, X, Y, Z, W$  with the following function dependency  $PQ \rightarrow X, P \rightarrow YX, Q \rightarrow Y, Y \rightarrow ZW$

Decompose into  $D_1$  and  $D_2$

$D_1: R = (PQST, PTX, QY, YZW)$

$D_2: R = (PQS, TX, QY, YZW)$

Which of the following options is correct?

- (A)  $D_1$  is lossy decomposition and  $D_2$  is lossless decomposition
- (B)  $D_1$  is lossless decomposition and  $D_2$  is lossy decomposition
- (C)  $D_1$  and  $D_2$  are lossy decomposition
- (D)  $D_1$  and  $D_2$  are lossless decomposition

[Ans. D]

12. The following relation records the age of 500 employees of the company, where emp NO (indicates employee number) is the key.  
 emp Age (emp NO, age) consider the following relational algebra expression  
 $\pi_{\text{emp NO}}(\text{emp Age}) \bowtie_{(\text{age} > \text{age}_1)} \rho_{\text{emp No 1, age 1}}(\text{emp age})$
- (A) Employee number of those whose age is maximum  
 (B) Employee number of only those employee whose age is more than the age of exactly one other employee  
 (C) Employee number of those employee whose age is not minimum  
 (D) Minimum
13. The lifetime of a component of a certain type is a random variable whose probability density function is exponentially distributed with parameter 2. For a randomly picked component of this type, the probability that its lifetime exceeds the expected lifetime (two decimal places) is \_\_\_\_\_.

[Ans. \*] Range: 0.30 to 0.40

14. S1: There exist random variable x and y such that

$$[(E[x - E(x)])(y - E(y))]^2 = \text{Var}(x) \text{Var}(y)$$

S2: For all random variables x and y

$$\text{Cov}[x, y] = E[|x - E(x)||y - E(y)|] \text{ correct?}$$

- (A) S1 & S2 = False  
 (B) S1 → True, S2 → False  
 (C) S1 & S2 → True  
 (D) S1 → False, S2 → True

[Ans. \*]

15. A:  $(p \wedge (\sim p \vee q) \rightarrow q)$   
 B:  $q \rightarrow (p \wedge (\sim p \vee q))$
- (A) Both True  
 (B) A is True & B is not True  
 (C) A is False & B is True  
 (D) Both False

[Ans. B]

16. Main memory size  $2^{32}$  bytes. It uses direct mapping and cache memory 32K bytes. The block size is 64 bytes. What is the number of bits used for TAG.

[Ans. \*] Range: 17 to 17



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17. Which of the following standard C functions invoke a system call when executed with a single thread in UNIX/LINUX OS?

- (A) Malloc
- (B) Calloc
- (C) Exit
- (D) Sleep

**[Ans. \*]**

18. The array is already sorted. And options are.

- (A) Insertion
- (B) Merge
- (C) Selection

**[Ans. B]**

19.  $10^n$ ,  $10^{\log n}$ ,  $n^n$  ascending order asymptotic notation order.

20. Which is not recursive

M is an automation

- (A) L(M) is a pda such that  $L \in \phi$
- (B) L(M) is a pda such that  $L \in \sigma^*$
- (C) L(M) is dfa  $L \in \sigma^*$
- (D) L(M) is a dfa  $L \in \phi$

**[Ans. \*]**

21. M is a TM, then

L(M) is a Turing machine which takes at least 2021 steps on all inputs

L(M) is a Turing machine which takes at least 2021 steps on some input Q

- (A)  $L_1$  decidable,  $L_2$ : undecidable
- (B)  $L_1$  undecidable,  $L_2$ : undecidable
- (C)  $L_1$  decidable,  $L_2$ : decidable
- (D)  $L_1$  undecidable,  $L_2$ : decidable

**[Ans. C]**

22. Which of the following will not be recursive CFL?

- (A)  $R \cdot L \cdot CFL$
- (B)  $RL \cup CFL$
- (C)  $RL \cap CFL$
- (D)  $RL - CFL$

$a^*b^*$

$(a^n b^m | n, m \geq 1)$

**[Ans. D]**



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23. 23, 32, 45, 69, 72, 73, 89, 97

- (A) Merge-Sort
- (B) Quick-Sort
- (C) Insertion-Sort
- (D) Selection-Sort

**[Ans. C]**24. The Boolean function  $(\bar{X} + \bar{Y} + \bar{Z})(X + \bar{Y})(Y + \bar{Z})$  is equivalent to?

25. S1: Function calling sequence is follows pre-order

S2: Function return follows post-order

Which of the following is true?

- (A) S1 only correct.
- (B) S2 only correct.
- (C) S1 and S2 both are correct.
- (D) S1 and S2 both are incorrect.

**[Ans C]**26.  $f_1 = 10^n, f_2 = n^{\log n}, f_3 = n^{\sqrt{n}}$ **[Ans. \*]**

27. Z be an array: defined such that

 $Z[i] = 1$  for  $0 \leq i \leq 9$ 

Then the function

function (int array [10], int n, int x)

{

int array; int count, var;

int var = 0;

int Total = array [var];

for (var = 1; var  $\leq$  n - 1; var ++)

{total = total \* x + array[var];

}

return total;

}

Called by parameters : function (Z, 10, 2) =?





28. True or false?

- A. The SLR (1) grammars are unambiguous and there are some unambiguous grammars which are not SLR (1)
- B. There exist at most  $O(n^3)$  time for algorithm to parse the CFG grammar.

**[Ans. A] Both statements are correct**

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