GATE 2022

CS & IT Engineering

Questions & Answers (Memory Based)
1. \[ \lim_{x \to 0} \frac{\sqrt{x}}{e^{2x}} \]

Find the limit

\[ \text{Ans. } -0.5 \]

2. A is \( n \times m \) and B is \( m \times n \) matrix C and D are \( n \times n \)

S1: \( \text{Tr}(AB) = \text{Tr}(BA) \)

S2: \( \text{Tr}(CD) = \text{Tr}(DC) \)

\[ \text{MCQ: 1 Mark} \]

A. S1 is correct
B. S2 is correct
C. Both correct
D. Both wrong

\[ \text{Ans. } C \]

3. \( A = \begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix} \)

\[ \text{MSQ: 2 Marks} \]

A. \( \begin{bmatrix} -1 \\ 0 \\ -2 \\ 2 \end{bmatrix} \)
B. \( \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix} \)
C. \( \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix} \)
D. \( \begin{bmatrix} 0 \\ 0 \\ -1 \\ 0 \end{bmatrix} \)

\[ \text{Ans. } A, C, D \]

4. \( y(x) = \begin{bmatrix} 2 & 0 & x \leq \frac{1}{3} \\ 1 & 3 & \frac{1}{4} \leq x \leq 1 \end{bmatrix} \)

\[ \text{Area} = ? \]

\[ \text{Ans. } 2.16 \]

5. \( x^2 + 2x + 6 = 0 \) find root and calculate the following equation \((r + 2)(r + 3)(r + 4)(r + 5)\)

\[ \text{MCQ: 2 Mark} \]

A. \(-51\)
B. \(+51\)
C. \(-126\)
D. \(+126\)

\[ \text{Ans. } C \]

6. The ___ is too high for to be considered ___

\[ \text{MCQ: 1 Mark} \]

A. Fare/fare
B. Fair/Fair
C. Fare/fair
D. Fair/Fare

\[ \text{Ans. } C \]

7. Consider the corner and mid to the triangle P, Q, R, S, T, U, not necessary in this order.

(i) P and R are parallel to S and T

(ii) S and u not adjacent

(iii) P is the side corner at T

\[ \text{MCQ: 2 Marks} \]

A. P cannot be in mid
B. S cannot be in corner
C. R cannot be in corner
D. U cannot be in the corner

\[ \text{Ans. } B \]

8. Examine the following statements:

(i) All children are inquisitive

(ii) Some children are inquisitive

(iii) No children are inquisitive

(iv) Some children are not inquisitive

Among these statements the two statements which cannot both be true simultaneously, but can both be false, would be

\[ \text{MCQ: 2 Marks} \]

A. (i) and (iii)
B. (i) and (iv)
C. (ii) and (iii)
D. (iii) and (iv)

\[ \text{Ans. } A \]
9. Consider two queues Q1 and Q2 such that initially Q1 contains 4 elements (1, 2, 3, 4) and Q2 is empty. The only operation allowed is enqueue and dequeue.

What is the minimum number of Enqueue operations required on Q1 to transfer the elements of Q1 to Q2 in reverse order?

[NAT: 2 Marks]

Ans. 6

10. Consider a 3-Dimensional array:

```c
#include <stdio.h>

void main ()
A[3][3][3] = {{1, 2, 3, 4, 5, 6, 7, 8, 9},
{10, 11, 12, 13, 14, 15, 16, 17, 18},
{19, 20, 21, 22, 23, 24, 25, 26, 27};

int i = 0, j = 0, k = 0;
for (i = 0 ; i < 3 ; i++)
    for (k = 0 ; k < 3 ; k++)
        printf("%d", a[i][j][k]);

[MCQ: 2 Marks]

A. 1 2 3
B. 4 5 6
C. 10 11 12
D. 10 11 12
```

11. Consider 2 linked list:

```
I  A -> B -> C -> D -> E
II E -> D -> C -> B -> A
```

What is the time complexity to get reverse of linked list I as II by using best algorithms and space complexity O(1)?

[MCQ: 2 Marks]

A. 0(1)
B. 0(n)
C. 0(n^2)
D. Not possible in O(1) space complexity

Ans. B

12. int x = 1;
int *P;
P = &x;
*P = 10;
P = &Z[1];
*(&Z[0] + 1)++ = 3;
printf("%d %d %d", x, Z[0], Z[1]);

[MCQ: 1 Mark]

A. 1 10 11
B. 10 10 14
C. 1 10 11
D. 10 11 14

Ans. B
13. Consider following address www.gate.co.in what is number of DNS pairwise response to access the address?

[NAT: 1 Mark]

Ans. 2

14. Consider between = 100 Mbps
Packet size = 1000 bytes
Speed = $3 \times 10^8$ m/s
Length = 2100 km
What will be the time (in millisecond round off to 2 decimal place) to reach packet to the destination?

[NAT: 1 Mark]

Ans. 7.08

15. R (A B C D E)
AB → C
BC → D
C → E
Find the number of super keys

[NAT: 1 Mark]

Ans. 8

16. In a relational data model which of the following statements is true

[MCQ: 2 Marks]

A. BCNF Decomposition preserve functional dependency
B. If all attribute of relation are prime attributes, then relation is in BCNF
C. Every relation has at least one nonprime attribute
D. A relation with only two attributes is always in BCNF.

Ans. D

17. 10 vertices, what is max no of edges in disconnected graph?

[NAT: 1 Mark]

Ans. 36

18. Let R₁ and R₂ be 4-bit register that stores number in 2’s complement form for the operation R₁ + R₂ which of following values of R₁ and R₂ gives overflow?

A. R₁ = 0011 R₂ = 0010
B. R₁ = 1101 R₂ = 1001
C. R₁ = 1011 R₂ = 1110
D. R₁ = 0011 R₂ = 0100

[MCQ: 1 Mark]

Ans. B

19. S → S
S → S + R
R → R * P / P
P → (S) / id
If $I_0 [S' \rightarrow S, S \rightarrow S + R],$
Then the number of productions in (goto ( closure (I₀, +)) is

[NAT: 1 Mark]

Ans. 5

20. S →, # T(S.val = S₁.val + T.val)
S → T(S.val = T.val)
T →, % R (T.val = T₁.val + R.val)
T → R (T.val = R.val)
R → id (R.val = id.val)
Then the value of $20 # 10%5 # 8%2%2$

[NAT: 2 Marks]

Ans. 80

21. Which of the following give the maximum throughput for transferring data from hard disk to main memory

[MCQ: 1 Mark]

A. DMA
B. Interrupt driven I/O
C. Programmed I/O
D. Polling based I/O

Ans. A

22. Consider 2 kB each, 64 kB main memory and 16-bit word, words P, Q, R, S are accessed 10 times in the order PQRS PQRS, P=A248, Q=CA8A, R=C28A, S=A262
Which of the following is true?

[MCQ: 2 Marks]
A. P is never replaced
B. S and Q remain in memory after completion of execution
C. Q is replaced every time when R is accessed
D. None

Ans. C

23. Consider the following 3 threads T₁, T₂, & T₃. T₁ has semaphore S₁, T₁ has semaphore S₂ and T₃ has semaphore S₃, each semaphore has following codes

<table>
<thead>
<tr>
<th></th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White (True)</td>
<td>White (True)</td>
<td>White (True)</td>
</tr>
<tr>
<td></td>
<td>{</td>
<td>{}</td>
<td>{}</td>
</tr>
<tr>
<td></td>
<td>Wait (S₃)</td>
<td>Wait (S₁)</td>
<td>Wait (S₂)</td>
</tr>
<tr>
<td></td>
<td>Print (&quot;C&quot;)</td>
<td>Print (&quot;B&quot;)</td>
<td>Print (&quot;A&quot;)</td>
</tr>
<tr>
<td></td>
<td>Signal (S₂)</td>
<td>Signal (S₃)</td>
<td>Signal (S₁)</td>
</tr>
</tbody>
</table>

Which of the following given o/p “BCABCABCA”
A. S₁=1, S₂=0, S₃=0
B. S₁=1, S₂=1, S₃=1
C. S₁=0, S₂=1, S₃=1
D. S₁=1, S₁=1, S₁=1

Ans. A

24. Consider the following 32-bit IEEE precision format. These are 3 registers namely RA, RB & RC store the value of A, B and C.

<table>
<thead>
<tr>
<th></th>
<th>RA</th>
<th>RB</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C14000000</td>
<td>C21000000</td>
<td>414000000</td>
</tr>
</tbody>
</table>

Which one is correct?
A. C = A + B
B. B = A + 2C
C. A – B > 0
D. B = 3C

Ans. C

25. What is the arrangement of 6 identical balls in 3 identical boxes?

Ans. 28

26. Which of the following is true?
A. Symbol table is accessed only during lexical analysis.
B. LR(1) can parse any DCFL
C. Data flow analysis is used for runtime memory.
D. If LR(1) has no reduce-reduce conflict, then LALR(1) also won’t have

Ans. B

27. L₁ = ww \{w ∈ \{a, b\}\}
L₂ = aⁿ w aⁿ \{w ∈ \{a, b\}*, n > 0\}

A. L₁ and L₂ both context free but not regular
B. L₁ and L₂ both are regular
C. L₁ and L₂ both are CFL
D. None of these

Ans. D

28. There are 5 balls in a bag, 3 green and 2 orange. If we pick one ball and ball is green, then no ball is replace with orange ball. Now another ball is picked. Find probability of getting orange ball.

A. 1/2
B. 19/50
C. 23/50
D. 2/25

Ans. C