GATE 2023

Computer Science

Questions & Solutions

📅 4th Feb Forenoon Session

IMS GATE ACADEMY™

A Division of **IMS Learning Resources Pvt. Ltd.**

🌐 www.imsindia.com/gate

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS

GATE 2023 Paper Analysis
Memory Based

Engineering Mathematics
7%

General Aptitude
15%

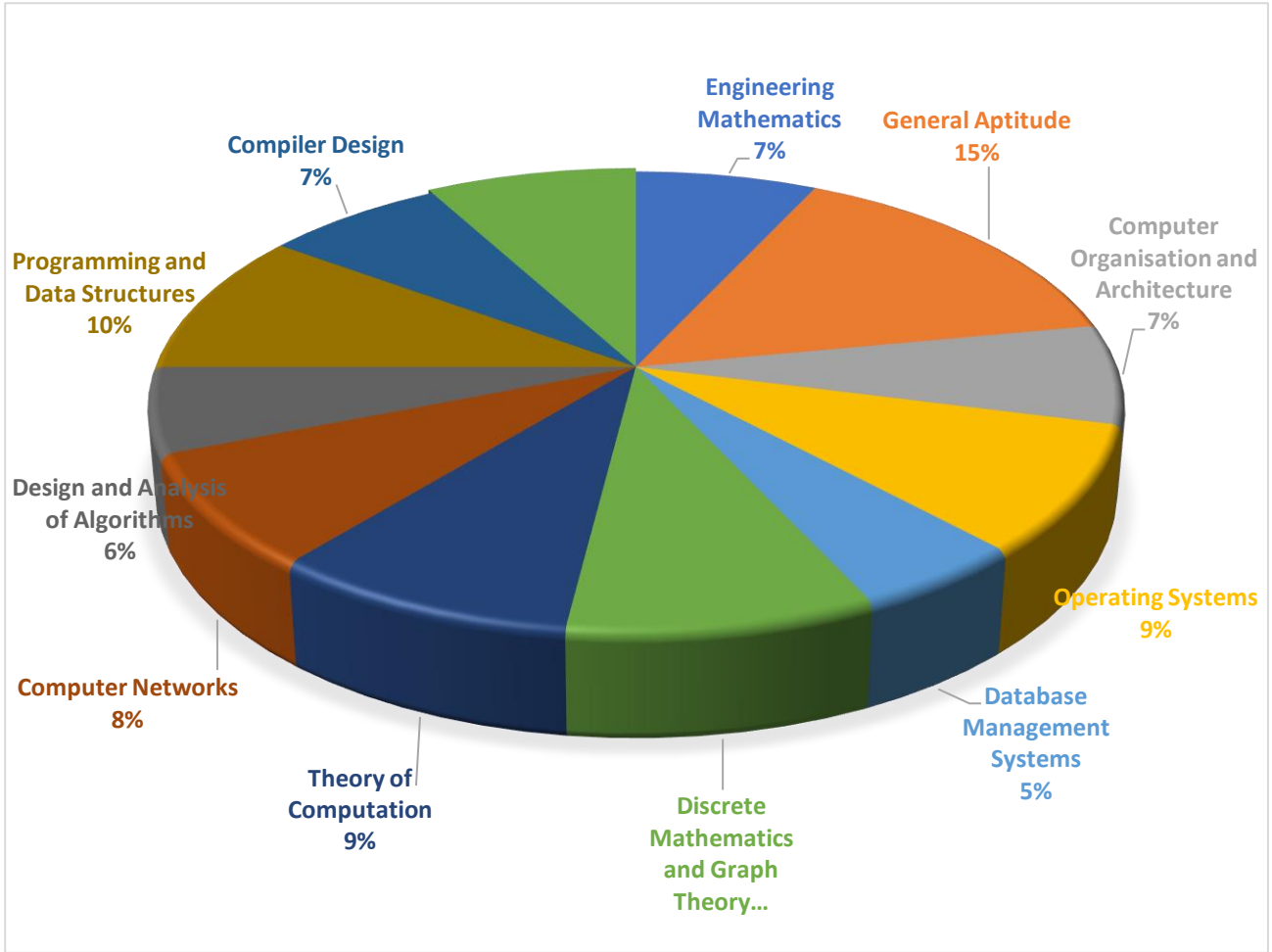Computer Organisation and Architecture
7%

Compiler Design
7%

Programming and Data Structures
10%

Operating Systems
9%

Design and Analysis of Algorithms
6%

Database Management Systems
5%

Computer Networks
8%

Theory of Computation
9%

Discrete Mathematics and Graph Theory...

GATE 2023 Paper Analysis
Memory Based

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS
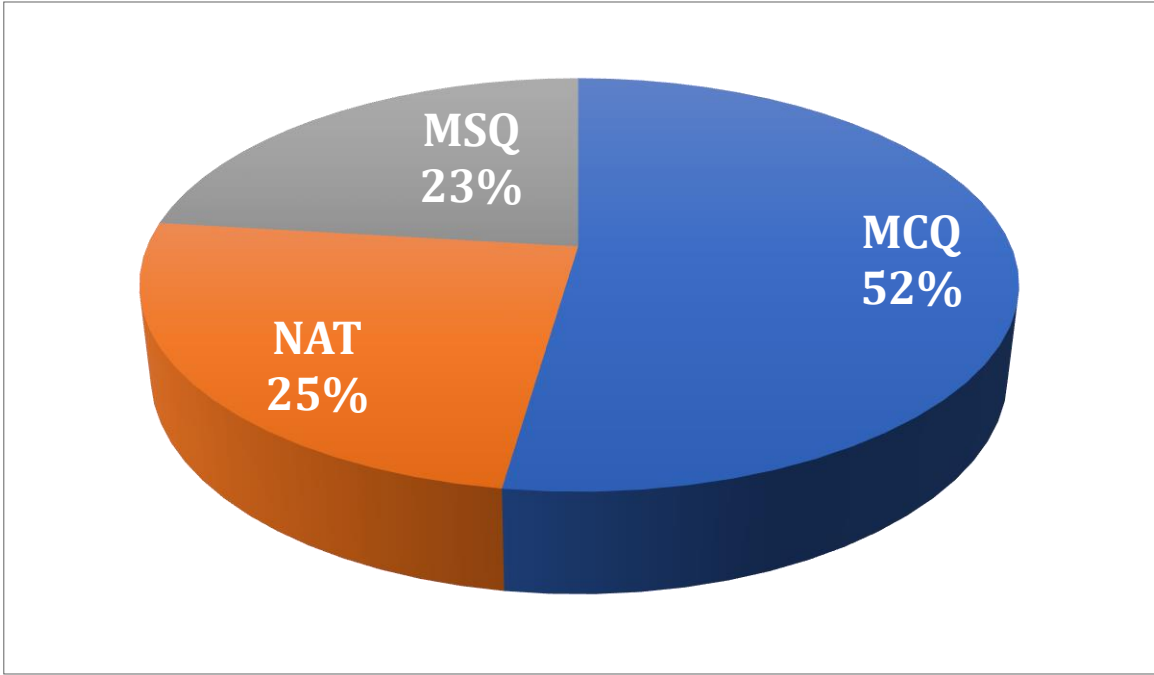
SECTION - A	GENERAL APTITUDE

1. We reached the station late, and .... missed the train.

   (A) Nearly   (B) hardly

   (C) Mostly   (D) Lately

Correct Option: A   **1 Mark**

2. Kind : _____ : : often : frequently

   (A) Kindly   (B) Cruel

   (C) Mean   (D) Type

Correct Option: D   **1 Mark**

3. $f_{n+1} = f_n + f_{n-1}$, $f_7 = 60$, $f_6 = 37$, $f_1 = ?$

   (A) 5   (B) 9

   (C) 4   (D) 8

Correct Option: C   **1 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS

4. Consider a relation student as:

Roll No	Student Name	Age	Gender
1	Rahul	90	Male
2	Aliya	85	Female
3	Aliya	90	Female
4	Rohit	70	Male
5	Shweta	65	Female

The following Query executed on above student table

Select *

from student,

where gender = Female and age > 65.

The number of table returned by the above query?

Answer: 2 **2 Mark**

5. A survey of certain year found that 90% of pregnant women used medical care at least once before giving the birth. Of these women 60% women's received care from doctor and 40% from other health care provider. Given this info which statement can be inferred certainly?

(A) Less than half of the pregnant women's received medical care at least once from a doctor.

(B) More than half of pregnant women received medical care at least once from a doctor.

(C) Less than half of pregnant women received medical care at most once from a doctor.

(D) More than half of pregnant women received medical care at most once from a doctor.

Correct Option: B **2 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS

SECTION - B	TECHNICAL

1. 3 stage pipelined processor having a delay of 10 ns, 20 ns, 14 ns, for the 1st, 2nd and 3rd stage respectively. No other delay and no other hazards. Assume 1 instruction is fetched in every cycle. The total execution time for 100 instructions is _____ ns.

Answer: 2040 ms | **1 Mark**

2. Calculate number of tag bits, cache size is 64kb & cache is 64 kb & cache is 8 ways set associative, System addresses 32-bit.

Answer: 19 | **1 Mark**

3. S1: In single linked list deletion, if node address is given then worst case delay will be 'n'.
S2: In double linked list deletion, if node address is given then worst case delay will be '1'.
(A) O(n) O(n)   (C) O(1) O(1)
(B) O(1) O(n)   (D) None of these

Correct Option: C | **2 Mark**

4. Which one of the following sequences when store in an array at locations A[1] to A[10] forms a max-heap
   (A) 23, 14, 19, 1, 10, 13, 16, 12, 7, 5
   (B) 23, 17, 14, 7, 13, 10, 1, 5, 6, 12
   (C) 23, 17, 10, 6, 13, 14, 1, 5, 9, 12
   (D) 23, 17, 14, 6, 13, 10, 1, 5, 7, 15

Correct Option: B   **1 Mark**

5. What does arity (degree) of a relation means?
   (A)   Number of entries in the table   (B)   Number of samples in the table
   (C)   Number of attribute in the table   (D)   Number of records in the table

Correct Option: C   **1 Mark**

6. Minimum number of states in DFA which does not accept strings containing there or more consecutive ones

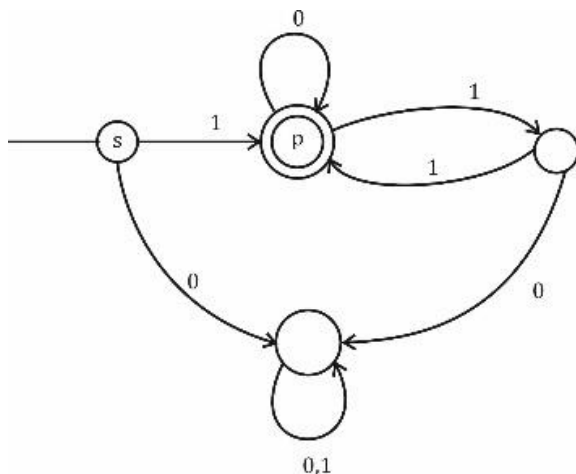**Answer: 4**   **2 Mark**

7. 8-way set associative cache of bytes, 64 KB (1 KB = 1024 bytes) is used in a system with 32 bit Address. The address is sub divided into TAG, INDEX and BLOCK OFFSET. Number of bits in TAG is ___?

Answer: 19   **2 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS

8.   Which of the following will be the regular expression for the given DFA

(A) 1(0+11)*   (B) 11*0

(C) 0(0+11)*   (D) (1+0)**

Correct Option: A   **1 Mark**

9.   Which of the following is correct?

(A)   Recursive languages are closed under intersection

(B)   Recursive Enumerable languages are closed under intersection

(C)   Regular languages are closed under intersection

(D)   Context free languages are closed under intersection

Correct Option: A,B,C   **2 Mark**

GATE 2023
Exam Analysis

IMS GATE™
ACADEMY
A Division of IMS Learning Resources Pvt. Ltd.

CS

10. $f(x)=x^3+15x^2-30x-36$ which of the statements are true.

    (A) $f(x)$ has a local maxima

    (B) $f(x)$ has a local minima

    (C) $f(x)$ does not have a local maxima

    (D) $f(x)$ has does not have local minima

Ans: A & B | **2 Mark**

11. $\int_{-3}^{3} \int_{-2}^{2} \int_{-1}^{1} (4x^2y - z^3) dz\,dy\,dx.$

Answer: 0 | **1 Mark**

12. Given, $f(n)=n$, $g(n)=n^2$, which of the following relation is correct?

    (A) $f(n)=O(g(n))$ (B) $f(n)=\Omega(g(n))$

    (C) $f(n)=\theta(g(n))$ (D) $f(n)=o(g(n))$

Correct Option: A,D | **2 Mark**

13. $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 2 & 3 \\ 3 & 4 & 1 & 2 \\ 2 & 3 & 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 4 & 1 & 2 \\ 4 & 1 & 2 & 3 \\ 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{bmatrix}$ Which of the following is correct?

    (A) det $(A) = 0$ (B) det$(A)=-$ det(B)

    (C) det $(AB)=$det$(A)\cdot$det(B) (D) None

Correct Option: B | **1 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
A Division of IMS Learning Resources Pvt. Ltd.

CS

14. S1: Two functions of time (t) $f(t)=0.01t^2$, $g(t) = 4t$, $0<t \propto \infty$

S2: For some $t>0$, $g(t)>f(t)$. There exists a T, such that $f(t) > g(t)$.

Which of the following are correct?

(A) S1   (B) S2

(C) Both   (D) None

Correct Option: C   **2 Mark**

15. Two coins tossed. Event A has both head. Events B has head on first throw. Event C has head on Second throw.

(A) A & B are independent   (B) B & C are independent

(C) A & C are independent   (D) $P(B/C) = P(B)$

Correct Option: B,D   **2 Mark**

16. The utilization of stop and wait protocol will be low if

(A) if link length is high and transmission rate is low

(B) if link length is low and transmission rate is low

(C) if link length is high and transmission rate is high

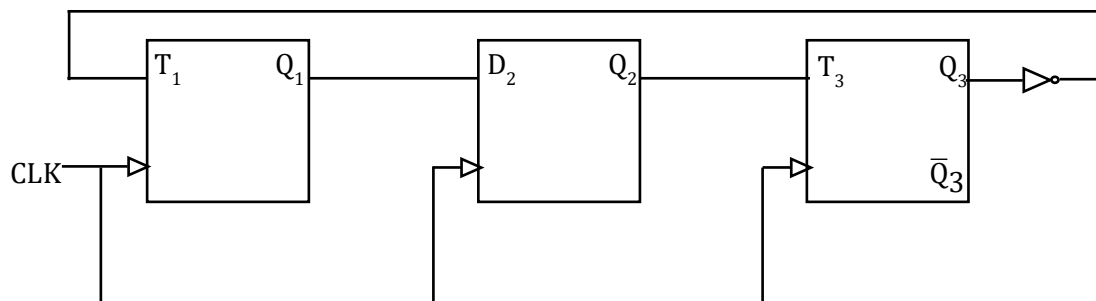(D) if link length is low and transmission rate is high

Correct Option: A, B   **1 Mark**

17. If $(132)_4 = (X)_5$, then the value of X is _____

Answer: 110   **2 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY ™
A Division of IMS Learning Resources Pvt. Ltd.

CS

18. If $Q_1Q_2Q_3 = 011$ initially, then which of the following state, $Q_1 \, Q_2Q_3$ will not be produced by given counter?

(A) 111

(B) 100

(C) 101

(D) 001

Correct Option: D

2 Mark

19. L_n is defined by $L_n = L_{n-1} + L_{n-2}$, Where $n \geq 3$, $L_1 = 1$ and $L_3 = 3$ which of the following is correct?

(A) $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{3}\right)^n$

(B) $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n + \left(\frac{1-\sqrt{5}}{2}\right)^n$

(C) $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n + \left(\frac{1-\sqrt{5}}{2}\right)^n$

(D) $L_n = \left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n$

Correct Option: B

2 Mark

20. Consider a computer system with 57 bit virtual address using multilevel page tables with L levels for virtual to Physical address translation. The page size is 4 KB and page table entry at any of the levels occupy 8 bytes. What is the value of L?

Answer: 5

2 Mark

21. Which of the following suffer from starvation?

    (A) Round robin   (B) shortest job first

    (C) FIFO   (D) priority scheduling

Correct Option: B, D   **2 Mark**

22. Which of the following will Guarantee the computer system transition from user modes to Kernel modes?

    (A) Page fault   (B) Malloc call

    (C) Function call   (D) System call

Correct Option: A, D   **2 Mark**

23. Consider the following Pseudo code. (option error)

Fun 1	Fun 2
While n > 1 do	for i = 1to 100n do
For i = 1 to n	x = x + 1
x = x + 1	end for
end for	
n = (n/2)	
end while	

    (A) $f_1 \in o(f_2)$ (B) $f_1 \in \theta(f_2)$

    (C) $f_1 \in t(f_2)$ (D) $f_1 \in O(f_2)$

Correct Option: A   **2 Mark**

GATE 2023
Exam Analysis

IMS GATE ACADEMY™
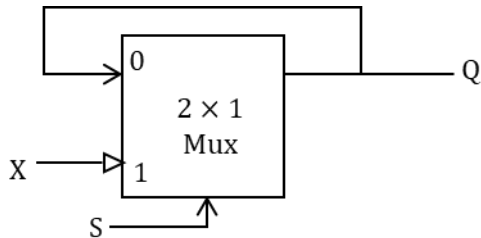A Division of IMS Learning Resources Pvt. Ltd.

CS

24. Consider 2 stage instruction pipeline, each stage delay, 10 ns, 20 ns, 14 ns respectively, no other delays in pipeline. What is the time for 100 instructions?

Correct Option: 2040   **1 Mark**

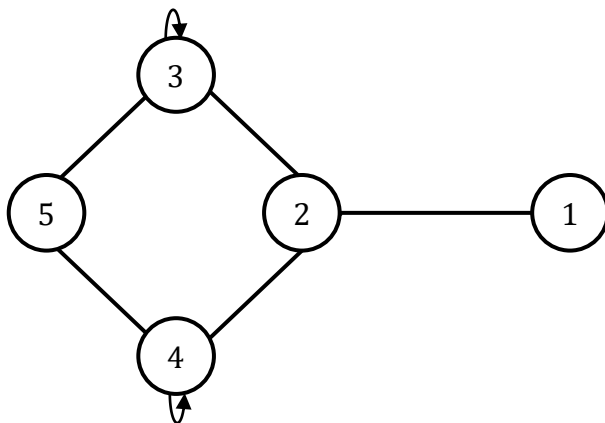25. The following circuit behaves as:

(A) D Flip-flop   (B) D Latch

(C) Half Adder   (D) De-Mux

Correct Option: B   **1 Mark**

26. A-adjacency matrix of $\lambda_1, \lambda_2 \dots \lambda_5$ are given values of A. Then $\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 = T_r(A)$

Answer: 2   **2 Mark**

27. G is simple finite undirected graph with $\{V_1, V_2, \ldots V_n\} N = \{1, 2, \ldots . n\}$ where $\Delta(G)$ is the minimum degree. Consider the greedy strategy for $i = 1, 2 \ldots \ldots n$

color $(Vi) = \min \{j \in N/\text{no neighbour of } Vi \text{ colored } j\}$

(A) Number of color used is chromatic number
(B) Number of colors used is almost $\Delta(G) + 1$
(C) Number of colors used is utmost $\Delta(G)$
(D) This procedure is result in proper vertex coloring

Correct Option: A, B, D   **2 Mark**

28. Geeta has a conjecture about integers which is of the form $\forall x \ [P(x) \Rightarrow \exists y Q(x, y)]$, where P is a statement about integers and Q is a statement about pairs of integers. Which of the following (one or more) option would imply Geetha's conjecture.

(A) $\exists x[P(x) \wedge \forall y Q(x, y)]$ (B) $\exists x[P(x) \wedge \exists y \ Q(x, y)]$

(C) $\exists y \ \forall x[P(x) \Rightarrow Q(x, y)]$ (D) $\forall x \forall y Q \ (x, \ y)$

Correct Option: C & D   **2 Mark**