Artificial Intelligence (Questions 153-170)

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154. Design a rule-based system for medical diagnosis. (8M, L4)
155. Compare forward vs backward chaining. (5M, L2)
156. Implement minimax algorithm for Tic-Tac-Toe. (10M, L5)
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(18 questions total)

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```sql
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ORDER BY amount DESC;
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(5M, L4)

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(28 questions total)

Computer Networks (Questions 199-245)

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200. Design IPv6 header format. (6M, L4)
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(47 questions total)

Data Structures (Questions 246-290)

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247. Convert this infix to prefix: A+(BC-(D/E^F)G)*H. (6M, L3)
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(45 questions total)

Theory of Computation (Questions 291-322)

291. Prove that $L=\{a^n b^n c^n \mid n \geq 1\}$ is not context-free. (8M, L5)
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$S \rightarrow ASB \mid \varepsilon$

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(32 questions total)

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```
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(5M, L3)

(38 questions total)

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361.Implement JWT authentication in Node.js. (8M, L4)

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(24 questions total)

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386.Disk scheduling: SCAN vs C-SCAN (seek times calculation). (7M, L4)

1. Artificial Intelligence (23AM2405)

IV Semester End Exam - June 2025

1.List and briefly explain types of Machine Learning Algorithms. *(7M)*
2.Outline AI Agents and interpret any two types. *(7M)*
3.Construct production rules to measure 2L using 4L and 3L jugs. *(6M)*
4.Compare BFS, DFS, and A* search algorithms. *(10M)*
5.Implement BFS/DFS in Python for a given graph. *(10M)*
6.Explain hill climbing algorithm limitations. *(6M)*
7.Describe adversarial search in game trees. *(4M)*
8.Solve A* algorithm for pathfinding (graph provided). *(10M)*
9.Compare monotonic vs non-monotonic reasoning. *(6M)*
10.Explain certainty factors in Bayes' Theorem. *(6M)*
(Total: 18 questions)

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2. Theory of Computation (23AM2404)

Mid-Sem & End-Sem Exams

11. Construct NFA for strings with "00" and "11". *(10M)*
12. Design NFA for strings ending with '1'. *(6M)*
13. Differentiate DFA and NFA (4 points). *(4M)*
14. Define derivation trees (leftmost vs rightmost). *(5M)*
15. Prove ambiguity in grammar: S→S+S|S*S|a|b|c. *(10M)*
16. Explain Chomsky hierarchy (Type 0-3). *(10M)*
17. Check if L={$a^n b^n$}∪{a} is DCFL. *(5M)*
18. Compare DPDA vs NPDA. *(5M)*

(Total: 32 questions)

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3. Database Management Systems (23AM2403)

19.List DBMS characteristics. *(5M)*
20.Advantages of DBMS over file systems. *(5M)*
21.Three-Schema Architecture explanation. *(5M)*
22.Draw ERD for university (Students, Courses, Professors). *(5M)*
23.Explain:
•Domain constraints *(3M)*
•Referential integrity *(3M)*
24.Create a view for employees earning >1.5L. *(5M)*
25.Write triggers to prevent deletion of active employees. *(5M)*
26.Compare SQL vs NoSQL. *(5M)*
(Total: 28 questions)

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4. Design & Analysis of Algorithms (23AM2402)

27.Solve T(n)=2T(n/2)+nlogn using Master's Theorem. *(8M)*
28.Implement Merge Sort (derive complexity). *(10M)*
29.Compare BFS and DFS with examples. *(8M)*
30.Horspool's string matching algorithm. *(4M)*
31.Dijkstra's algorithm (graph provided). *(6M)*
32.Construct Huffman codes for: a(5), b(9), c(12), d(13). *(6M)*
33.Solve N-Queens for N=4. *(8M)*
34.Traveling Salesman approximation algorithm. *(8M)*
(Total: 52 questions)

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5. Computer Networks

35.Compare IPv4 vs IPv6. *(5M)*
36.Solve CRC for bitstream 1101011011 (poly: x^4+x+1). *(7M)*

37.Explain Go-Back-N ARQ (10 packets, 7th lost). *(5M)*
38.Compare TCP and UDP. *(5M)*
39.Subnet 192.168.1.0/24 for 60 hosts each. *(5M)*
40.Explain HTTP persistent connections. *(8M)*
(Total: 47 questions)

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6. Data Structures

41.Insert node in circular linked list (C code). *(5M)*
42.BST operations: Insert 7,5,1,18; Delete 16. *(5M)*
43.Construct binary tree from Inorder/Postorder traversals. *(6M)*
44.AVL tree rotations (insert 18,1,19,16). *(10M)*
45.Compare Red-Black vs Splay trees. *(5M)*
(Total: 45 questions)

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7. Java Programming

46.Demonstrate constructor overloading for 'Person' class. *(5M)*
47.Predict output:
java
int x = 130; byte b = (byte)x; System.out.println(b); // -126
``` *(5M)*
48. Implement matrix multiplication. *(5M)*
49. Explain Java buzzwords (platform independence, etc.). *(6M)*

*(Total: 38 questions)*

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### **8. Full Stack Development (23AM2406)**
50. HTML document structure example. *(5M)*
51. CSS Box Model explanation. *(5M)*
52. Implement sticky positioning. *(5M)*
53. CSS specificity rules. *(5M)*

**8. Computer Organization & Architecture (COA)**

54.Draw ARM7TDMI processor architecture. *(6M)*
55.Compare RISC vs CISC pipelining. *(4M)*
56.Explain Thumb instruction set vs ARM set. *(5M)*
57.ARM7TDMI pipeline stages (diagram required). *(5M)*
58.Write ARM assembly to rotate bits in R1 by 3 positions. *(4M)*
59.Analyze this ARM code:
arm
LDR R1, =num1
CMP R3, R4
MOVGT R5, R3
```

``` *(6M)*

*(Total: 22 questions)*

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### **9. Discrete Mathematics**
60. Prove "a divides b" is a partial order on A={1,2,3,4,6,12}. *(5M)*
61. Solve recurrence: 0, 2, 6, 12, 20, 30... *(6M)*
62. Tower of Hanoi moves for n=5 disks. *(5M)*
63. Virus growth problem: 1000 files, 250% increase every 2 hours. *(5M)*
64. Prove $K_5$ (complete graph) is non-planar. *(5M)*
65. Explain Five Color Theorem. *(5M)*

*(Total: 34 questions)*

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### **10. Operating Systems**
66. Compare FCFS vs Round-Robin scheduling. *(6M)*
67. Banker’s algorithm safety sequence. *(5M)*
68. Page replacement algorithms (FIFO/LRU). *(7M)*

*(Total: 18 questions)*

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### **11. Transforms & Numerical Techniques (Contd.)**
69. Solve Laplace equation $\nabla^2 u=0$ with boundary conditions. *(10M)*
70. Poisson equation $\nabla^2 u=-81xy$ (h=1/3). *(10M)*
71. Fourier transform of:
```math
f(x) = \begin{cases}
x & 0<x<1 \\
2-x & 1<x<2 \\
0 & x>2
\end{cases}
``` *(6M)*

(Total: 19 questions)

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12. Theory of Computation (Contd.)
72. Minimize DFA for even 0’s (input "00"). *(5M)*
73. Construct PDA for $L=\{a^n b^n \mid n\geq 1\}$. *(8M)*
74. Prove $L=\{ww^R \mid w\in(0+1)^*\}$ is context-free. *(7M)*
```

(Total: 32 questions)

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13. Data Structures (Contd.)
75. Implement stack using linked list. *(5M)*
76. Convert infix `(A*B+C^D)*F` to postfix. *(10M)*
77. Threaded binary tree advantages. *(4M)*
78. B-tree insertion (order=3): 8,5,1,19,16. *(6M)*

(Total: 45 questions)

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14. Java Programming (Contd.)
79. Output prediction:
```java
int a=10; int b=a<<2; System.out.println(b); // 40
``` *(5M)*
80. Why Java doesn’t support multiple inheritance (code example). *(5M)*
81. Hybrid inheritance implementation. *(5M)*

(Total: 38 questions)

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15. Full Stack Development (Contd.)
82. CSS reset importance with example. *(5M)*
83. Responsive design using media queries. *(5M)*
84. Flexbox vs Grid layout. *(5M)*

(Total: 24 questions)

Question Index (100-387)
Computer Networks (Contd.):
100. Link-state routing for Node A to I. *(6M)*
101. TCP congestion control (slow start). *(5M)*
102. SMTP connection process. *(5M)*

DBMS (Contd.):
120. BCNF normalization example. *(8M)*
121. ACID properties explanation. *(5M)*

AI (Contd.):
150. Expert system components. *(4M)*
151. Rule-based vs Model-based expert systems. *(6M)*

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