MCA 3 Sem Imp list

Operations Research (OR)

1. Define Operations Research. Discuss its scope and applications.
2. Explain the steps involved in the OR problem-solving process.
3. Formulate Linear Programming Problems (LPP) with examples.
4. Solve LPP using the Graphical Method.
5. Explain the Simplex Method with a solved problem.
6. What is the Dual of a LPP? Derive with an example.
7. Explain Big M and Two-phase Methods.
8. Discuss Transportation Problems and their solution methods.
9. Solve an Assignment Problem using the Hungarian Method.
10. Explain Game Theory. Solve a 2x2 game with no saddle point.
11. What is Decision Theory? Explain decision under uncertainty.
12. Explain Replacement and Maintenance Models.
13. Discuss Queuing Theory and its models.
14. What is Simulation? Explain steps with an example.
15. Explain Inventory Models with deterministic demand.
16. Explain CPM and PERT techniques.
17. Define Slack, Float, Critical Path in project networks.
18. Solve a network problem using PERT.
19. Discuss Goal Programming.
20. Explain Integer Programming Problems.

📘 Design and Analysis of Algorithms (DAA)

1. Define algorithm, flowchart, and pseudo-code.
2. Time and Space Complexity – Explain with examples.
3. Explain Asymptotic Notations: Big-O, Ω, Θ.

4. What is Divide and Conquer? Apply to Merge Sort.
5. Explain Quick Sort and its complexity.
6. Solve problems using Strassen's Matrix Multiplication.
7. Explain Greedy Method with examples.
8. Describe Prim's and Kruskal's algorithms.
9. What is Dynamic Programming? Solve using 0/1 Knapsack.
10. Explain the concept of Optimal Binary Search Tree.
11. What is Backtracking? Solve N-Queens problem.
12. Explain Hamiltonian Cycle problem.
13. What is Branch and Bound? Apply to Travelling Salesman Problem.
14. Compare Greedy vs Dynamic Programming.
15. What is NP, NP-complete, and NP-hard?
16. Explain Graph Coloring using backtracking.
17. Write and analyze Insertion Sort algorithm.
18. Explain All-pairs shortest path using Floyd Warshall.
19. Describe Dijkstra's algorithm.
20. What is Heap Sort? Explain with complexity.
21. Write pseudocode for Binary Search and analyze it.

📘 **Computer Networks (CN)**

1. Define computer network and its types.
2. Explain the OSI Model and its layers.
3. Describe TCP/IP model and compare with OSI.
4. Discuss transmission media types.
5. Explain switching techniques: circuit, packet, and message switching.
6. Explain error detection methods – Parity, CRC.
7. Discuss data link layer protocols (HDLC, PPP).
8. What is MAC? Explain CSMA/CD and CSMA/CA.

9. Explain IP addressing and subnetting.
10. Discuss IPv4 vs IPv6.
11. What is Routing? Describe distance vector and link state.
12. Explain protocols: TCP, UDP, ICMP, ARP.
13. Explain DNS, DHCP, and HTTP.
14. Discuss congestion control in networks.
15. Explain socket programming basics.
16. Describe email protocols: SMTP, POP3, IMAP.
17. Explain firewalls and network security basics.
18. What is Network Address Translation (NAT)?
19. Explain the concept of bandwidth and latency.
20. Describe wireless networking and Wi-Fi standards.
21. What are proxies and VPNs?

🤖 Artificial Intelligence and Expert Systems

1. Define AI. Discuss its goals and applications.
2. Differentiate between weak and strong AI.
3. Explain AI techniques: Search, Learning, Reasoning.
4. Describe problem-solving approaches in AI.
5. Explain Uninformed Search: BFS, DFS.
6. Explain Informed Search: Best First, A*.
7. Describe Game Playing using Minimax algorithm.
8. What is knowledge representation? Discuss types.
9. Explain Semantic Nets and Frames.
10. Describe Predicate Logic and Resolution.
11. What is an Expert System? Components and Architecture.
12. What is Forward and Backward Chaining?
13. Explain Rule-Based Expert Systems.

14. What is Fuzzy Logic? Applications of fuzzy systems.
15. Discuss Machine Learning types: supervised, unsupervised.
16. Explain Neural Networks basics.
17. What is Natural Language Processing (NLP)?
18. Explain Agents and Multi-agent systems.
19. Define Turing Test. Is it still relevant?
20. Explain Prolog and LISP basics.
21. What is Genetic Algorithm?

💾 Database Management System (DBMS)

1. Define DBMS. List its features and advantages.
2. Explain architecture of DBMS.
3. Describe data models: Hierarchical, Network, Relational.
4. Define keys: primary, foreign, candidate, super key.
5. Explain ER Model and convert ER to Relational model.
6. Write SQL queries for CRUD operations.
7. Explain joins: inner, outer, self, and cross joins.
8. What is normalization? Explain 1NF to 3NF with examples.
9. What is transaction? Discuss ACID properties.
10. Describe concurrency control techniques.
11. Explain deadlock and recovery methods.
12. What is indexing? Types of indexes.
13. Explain triggers and stored procedures.
14. Compare file systems with DBMS.
15. Explain relational algebra operations.
16. What is view? Explain with syntax.
17. Discuss distributed databases.
18. Explain NoSQL databases.

19. What is data integrity and constraints?

20. Explain data mining basics.

21. What is data warehousing?