For Mid-2 Exam

Expecting :- DAA. Part-B.

Set-1

1Q:- What is an Optimal Binary search Tree (OBST)?

1A) write an algorithm and time complexity for OBST. Construct an OBST with the following data:

Let $n = 4$; $(a_1, a_2, a_3, a_4) = (do, if, int, while)$.

$P[1:4] = (3, 3, 1, 1)$; $q[0:4] = (2, 3, 1, 1, 1)$.

The P's and q's have been multiplied by 16 for the convenience.

2. 1BQ A) Describe the Travelling sales person problem. Construct the optimal Tour of the following problem using Travelling salesperson.

		A	B	C	D → cities
		1	2	3	4
R_1 - A	1	0	10	15	20
R_2 - B	2	5	0	9	10
R_3 - C	3	6	13	0	12
R_4 - D	4	8	8	9	0
↓					
Dates		C_1	C_2	C_3	C_4

(OR)

4 2AQ Discuss the basic method of backtracking algorithm. Also explain the following
a) Live node b) E-Node c) Answer node
d) Answer path e) Dead node f) Answer.

(OR)

2BQ:- Discuss algorithm of Hamiltonian cycle and Graph Colouring. Also draw the state space tree for n = 4 and m = 3 graph colouring problem.

3AQ:- Define Branch and Bound.
Discuss L.C and FIFO (B&B alg)

(OR)

3BQ:- Describe FIFO Brand and Bound algorithm. Also Draw the portion of state space tree generated by FIFO – B&B alg for Knapsack instances.
n = 5, (P1, P2, ... P5) = (10, 15, 6, 8, 4),
(W1, W2, ... W5) = (4, 6, 3, 4, 2) and M = 12.

IV	Backtracking	10

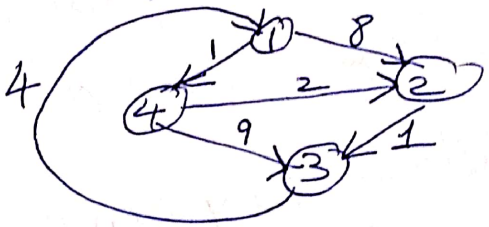
Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph ... Hamiltonian cycles.

(2)

4AQ:- Draw the portion of state space tree generated by LCBB for the knapsack instances $n=4$, $(P1, P2 \cdots P5) = (10, 10, 12, 18)$, $(w_1, w_2, \cdots w5) = (2, 4, 6, 9)$ and $M=15$.

(OR)

4BQ:- ~~Draw~~ State the following all pairs Shortest Path Problem and find the shortest distance from each node to each other in the graph.



5AQ:- Differentiate N, NP-Hard and NP-complete problems.

(OR)

5BQ:- State the cook's theorem. And Explain its importance.

Unit-5 Short Q.

1. NP-Hard, NP-complete, P-class, NP-class, deterministic and non-deterministic problems.
2. decision problem and optimization problem, approximate solution, promising and non-promising nodes.
3. formula for bounding function in knapsack problem → L.C, FIFO
4. about travelling salesperson problem
5. time complexity and space complexity of travelling salesperson problem.

Long Questions Extra 5th Unit :-

1. Convert Boolean formula $B = (x_1 \leftrightarrow x_2)$. $(\overline{x_3 + x_4 x_5}) \cdot (x_1 x_2 + x_3 x_4)$ into CNF.
2. Pseudo code description of B & B alg for Travelling salesperson problem.

Expecting Set-2 for Mid-2. (3)

Part-B.

1A Q:- Explain the concepts of reliability design problem. Design a three-stage system with device types D1, D2, and D3. The costs are $30, $15 and $20 respectively. Reliability is 0.9, 0.8 and 0.5. The total cost of the system must not be more than C = $105.

(or)

1B. A Q:- Explain the 0/1 Knapsack problem with an algorithm. Find an optimal solution for the 0/1 Knapsack instance for n=4, m=16, profits are (P1, P2, P3, P4) = (10, 6, 5, 1), weights are (W1, W2, W3, W4); W4 = (9, 6, 7, 3) Using Dynamic programming.

B Q:- write an algorithm (Floyd-Warshall algorithm) for all-pairs-shortest path problem.

2AQ:- what is the sum-of-subsets problem? Solve the following sum-of-subsets problem using Backtracking. Let $n=6$, $m=30$, and $w[1:6] = (5, 10, 12, 13, 15, 18)$. (Draw the state space tree and the solution using fixed-tuple sized format).

(OR)

2BQ:- Discuss in detail about 4-Queens problem with state space tree and solution tree. write an algorithm for N-Queen problem.

3AQ:- Draw the portion of state space tree generated by FIFO-Board & Bound for the Knapsack instances $n=5$, $(P1, P2, \cdots P5) = (10, 15, 6, 8, 4)$, $(w1, w2, \cdots w5) = (4, 6, 3, 4, 2)$ and $M=12$.

(OR)

3BQ:- Draw the portion of state space tree generated by LCBB for the following Travelling Sales person problem.

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	30	10	11
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

4Q:- Explain about satisfiability problem with explame.

(or)

4BQ:- Describe FIFO Branch and Bound Algorithms. Explain NP-Hard and NP-Complete problems.

5Q:- Explain P-class, NP-class problems.

→ P, NP-Hard, NP-Comple, Non-Deterministic and deterministic problems.

(or)

5BQ:- what is non-deterministic algorithm? write the non-deterministic algorithm for Knapsack Problem.

Short Questions:-

1. what is Dynamic Programing; its applications.
2. OBST, Knapsack Problem.
3. features of Dynamic Programing.
4. Principle of Optimality.

⇒ General procedure for Dynamic programming.
⇒ Define all Pair Shortest Path Problem.
⇒ State time and space efficiency of OBST.
⇒ Draw backs of Dynamic Programing.

Unit – IV

1. requirements needed for performing Backtracking
2. explicit and Implicit constraints.
3. State space tree, Answer tree, live node, E node, dead node.
4. factors influence the efficiency of the backtracking algorithm.
5. Branch and Bound method.
6. searching techniques commly used in Brand and Bound.
7. State 8- Queens Problem; 4 Queen.
8. Sum of subsets problem.
9. m- Colorability decision problem.
10. chromatic number of graph.
11. dynamic trees.