



Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q.No	Questions	CO	Marks
Q1	<p>Use the Alpha-Beta pruning algorithm to prune the game tree shown below assuming child nodes are visited from left to right. Show all final alpha and beta values computed at root, each internal node explored, and at the top of pruned branches.</p> <p>MAX</p> <p>MIN</p>	3	5
Q2	<p>Write a Python program to perform Depth-First Search (DFS) program to use an explicit stack (instead of recursion) to traverse the graph from node 'A':</p> <p>(a) Print the order in which nodes are visited.</p> <p>(b) Ensure nodes are processed in Last In, First Out (LIFO) order.</p> <p>Assume the graph is stored as an adjacency list in a dictionary.</p>	2	5

Q3	Use linear regression to predict house prices based on area, number of bedrooms, and house age. Create your own dataset, train the model, and evaluate it using percentage accuracy based on Mean Absolute Error.	4	5
Q4	Find the solution to the following blocks world problem using simple hill method. State the heuristics used. What are the limitations of hill climbing algorithms? <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Initial State</p> </div> <div style="text-align: center;">  <p>Final State</p> </div> </div>	4	5
Q5	Discuss the time and space complexity of the A* algorithm in different scenarios. How do factors like the heuristic function, graph size, and branching factor affect its performance? What techniques can be used to reduce memory usage while maintaining efficiency?	3	5
Q6	Suppose a genetic algorithm uses chromosomes of the form $x = abcdefgh$ with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: $f(x) = (a + b) - (c + d) + (e + f) - (g + h)$, and let the initial population consist of four individuals with the following chromosomes: $x_1 = 6\ 5\ 4\ 1\ 3\ 5\ 3\ 2$, $x_2 = 8\ 7\ 1\ 2\ 6\ 6\ 0\ 1$, $x_3 = 2\ 3\ 9\ 2\ 1\ 2\ 8\ 5$ and $x_4 = 4\ 1\ 8\ 5\ 2\ 0\ 9\ 4$ (a) Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last. (b) Perform the following crossover operations: (i) Cross the fittest two individuals using one-point crossover at the middle point. (ii) Cross the second and third fittest individuals using a two-point crossover (points b and f). (iii) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover.	4	5
Q7	What is the purpose of one-hot encoding, and when is it necessary? Can one-hot encoding lead to multicollinearity issues in linear regression models? If so, how do you address them? Explain with the help of a python program.	3	5