JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Make-up Examination-Nov-2025

COURSE CODE (CREDITS): 18B1WCI741 (3) MAX. MARKS: 25

COURSE NAME: Artificial Intelligence

COURSE INSTRUCTORS: HRI/KTS/SRJ MAX. TIME: 1 Hour 30 Minutes

Note: Note: (a) All questions are compulsory.

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

Q. No	Question	CO	Marks
Q1	What is the probability of making a move from one node to another in Simulated Annealing Algorithm? Discuss mathematically.	CO1	4
Q2	Describe the probability of kth ant's moving from city i to j in the Ant Colony Optimization for Travelling Salesman Problem (TSP).	CO2	4
Q3	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: x1 = 6 5 4 1 3 5 3 2 x2 = 8 7 1 2 6 6 0 1 x3 = 2 3 9 2 1 2 8 5 x4 = 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. **c)** Suppose the new population consists of the six offspring individuals received by the crossover operations in the above question. Evaluate the fitness of the new population, showing all your workings. Has the overall fitness improved?	CO2	4

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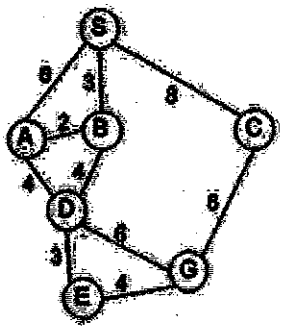
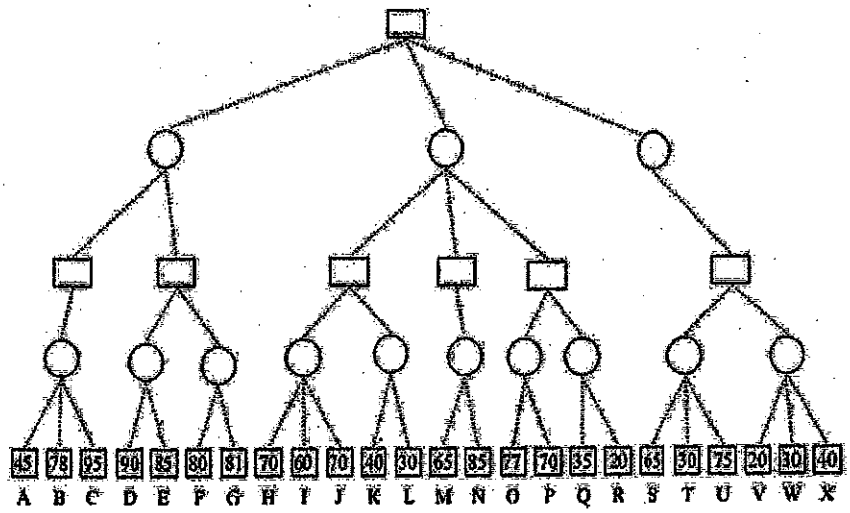
Q4	Find the solution path from Source Node (S) to Goal Node (G) using A* Algorithm.  	CO2	4
Q5	Describe the evaluation function in Tic-Tac-Toe Game. Show the moves considering 2 ply lookahead.	CO2	4
Q6	In the game tree given in the following image, the leaves are labelled with the values from the evaluation function. The letter labels [A... X] below the leaves are names of the leaves. Show the order in which algorithm Minimax and Alpha-Beta pruning will inspect the nodes, explaining all the decisions made, along with diagrams where appropriate. What is the minimax value of the game?  	CO2	5