

Department of Computer Science & Engineering
Indian Institute of Technology Kharagpur
Tutorial 5
Subject: Analysis and Design of Algorithms (CS60007)
Time: 1 hour
November 7, 2024

ANSWER ALL QUESTIONS

1. Consider the Constrained Travelling Salesperson Problem (CTSP), which needs to minimize the total tour but not allow the distance between cities in the tour to exceed a value K (which is an input along with the graph). Present a state space definition for the CTSP. Define a heuristic estimate that is a guaranteed lower bound. Show the working of Algorithms A^* , IDA^* and DFBB on this state space definition and heuristic estimate for the given problem, on a non-trivial graph of 4 nodes and all nodes being connected by unique cost integer valued edges.
2. Prove or disprove the statement or indicate whether it is partially true: For any search problem, DFBB will expand every node that is expanded by A^* but may expand some nodes that A^* does not expand. Assume both use the same heuristic estimate.
3. Prove or disprove the statement or indicate whether it is partially true: For any search problem, IDA^* will expand every node that is expanded by A^* but may expand some nodes that A^* does not expand. Assume both use the same heuristic estimate.
4. Present a Genetic Algorithm formulation to solve the CTSP above and show some steps of its working on the same example that you have used in problem 1.