

Department of Computer Science and Engineering
Level 4 Term 2
Course code: CSE 422,
Course title: Artificial Intelligence Sessional

Name:

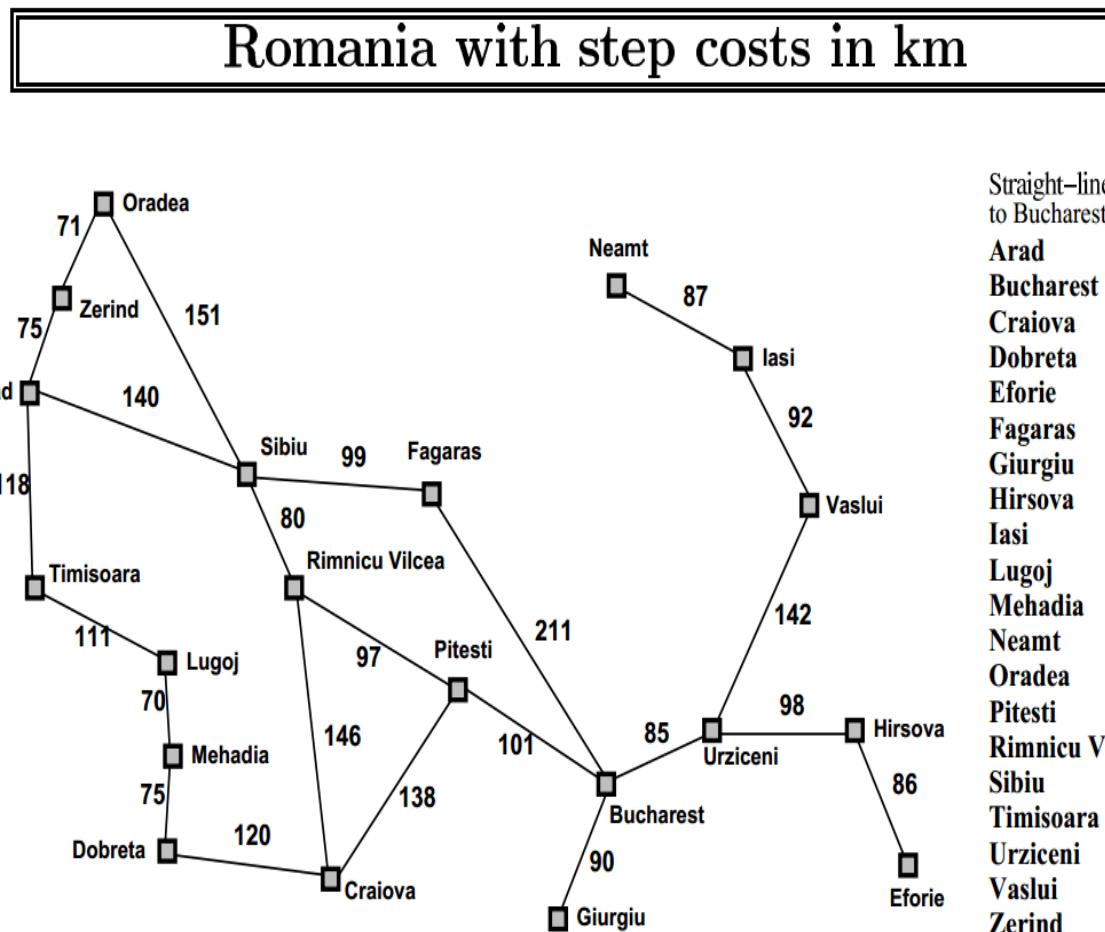
ID:

Time: 60 Minutes

Full Marks: 20

1. You are given a simplified map of Romania where cities are represented as nodes and roads connecting them are weighted edges (distance in km). The goal is to find the shortest path from Arad to Bucharest using the A search algorithm*. A straight-line distance (SLD) heuristic is provided for each city.

Graph and Heuristic:



- a. Write a Python function to perform A* search on the given graph. 10
- b. Your function should return the shortest path along with sequence of cities visited and total cost from Arad to Bucharest. 5
- c. Use a priority queue (min-heap) to select the next city based on $f(n) = g(n) + h(n)$. 5

Assessment Rubric

Question	Criteria	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
(a) Function Implementation	Correctness and completeness of A* algorithm	Fully correct implementation; uses priority queue properly; handles visited nodes and returns correct path and cost	Mostly correct; minor errors in queue handling or node expansion	Partially correct; returns path but may have errors in cost calculation or visited node handling	Incomplete function; major errors, algorithm logic mostly incorrect	Function missing or does not implement A* at all
(b) Output: Shortest Path & Cities Visited	Correctness of returned path, sequence, and cost	Path sequence and total cost are correct; all cities visited in proper order	Minor mistakes in path sequence or cost slightly off	Partially correct path; cost may be incorrect	Path is mostly incorrect or sequence inconsistent; cost unreliable	No output or completely incorrect
(c) Priority Queue Usage	Proper use of min-heap for selecting node based on (f(n))	Correctly uses min-heap; f(n) calculation accurate; algorithm efficiently selects next node	Uses priority queue correctly but f(n) calculation has minor issues	Priority queue used but inefficiently or partially incorrect; f(n) calculation incomplete	Priority queue misused or inefficient; f(n) not calculated properly	No use of priority queue; nodes selected incorrectly