

(3 Hours)

(Total Marks: 80)

- N. B. :
1. Question No. 1 is compulsory.
 2. Attempt any **Three** questions out of remaining **Five** questions.
 3. **Figures** to the **right** indicate **full** marks.
 4. Assume suitable data if **necessary**.

1. Attempt any **FOUR** of the following : 20
- a) List and explain application of AI.
 - b) List and explain advantages and limitations of Simulated Annealing over Hill climbing.
 - c) The early AI systems used general systems, little knowledge. AI researchers realized that specialized knowledge is required for rich tasks to focus reasoning. **State** the major advances observed in different domains of AI in the last decade of 20th century or in the first decade of 21st century (i.e 1990-2010).
 - d) **Outline** the facts which agent perceives in the WUMPUS world.
 - e) Explain in short Rote Learning.

2. 10

- a) **Apply** A* Algorithm to find the optimal path for the graph shown in **Figure-1**. Show the order of nodes expanded and the status of fringe during node expansion. Apply, straight line distance given in **Table-1** as a heuristic function. Assume the start state (city) is Arad and the Goal state (city) is Bucharest.
 Note: SLD Straight Line Distance.

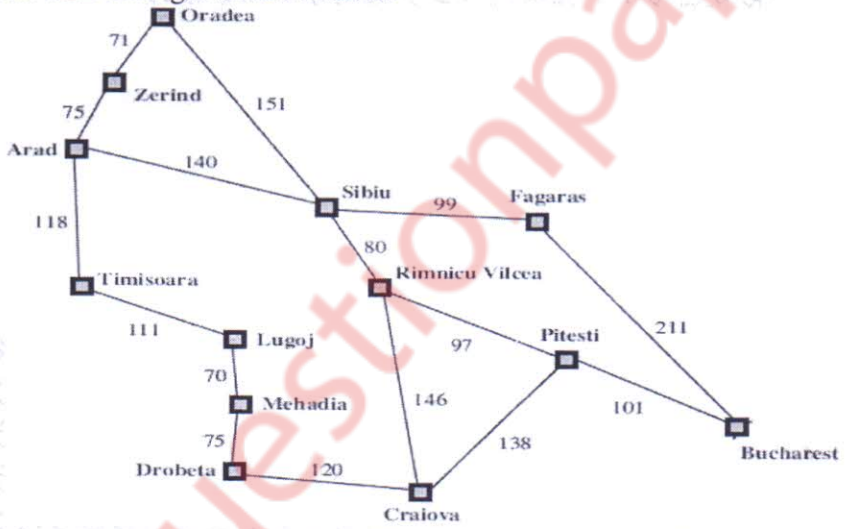


Figure-1: A simplified road map of part of Romania.

Table-1 : Straight Line Distance (SLD) between cities.

| SN | City | SLD | SN | City | SLD |
|----|-----------|-----|----|----------------|-----|
| 1 | Arad | 366 | 8 | Sibiu | 253 |
| 2 | Bucharest | 0 | 9 | Mehadia | 241 |
| 3 | Craiova | 160 | 10 | Timisoara | 329 |
| 4 | Drobeta | 242 | 11 | Oradea | 380 |
| 5 | Fagaras | 176 | 12 | Pitesti | 100 |
| 6 | Zerind | 374 | 13 | Rimnicu Vilcea | 193 |
| 7 | Lugoj | 244 | | | |

- b) Explain Error Back propagation algorithm in detail. 10

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3. a) Explain Hidden Markov Model with the help of example which includes state transition matrix, observation probability matrix, and initial probability matrix. Explain how Viterbi algorithm reduces complexity from exponential to linear? 10
- b) Explain forward and backward chaining with suitable example. 10
4. a) Explain in detail hand written digit recognition using suitable model for learning, training and testing. 10
- b) **Assume** that you have a new burglar alarm installed at home. It is fairly reliable at detecting a burglary, but also responds on occasion to minor earthquakes. You also have two neighbors, John and Mary, who have promised to call you at work when they hear the alarm. John nearly always calls when he hears the alarm, but sometimes confuses the telephone ringing with the alarm and calls then, too. Mary, on the other hand, likes rather loud music and often misses the alarm altogether. Given the evidence of who has or has not called, we would like to estimate the probability of a burglary.
Draw/Infer a Bayesian network for this domain with suitable probability tables. 10
5. a) Explain Logistic Regression with suitable example. 10
- b) Suppose we generate a training set from a decision tree and then **apply** decision-tree learning to that training set. Is it the case that the learning algorithm will eventually return the correct tree as the training-set size goes to infinity? Why or why not? 10
6. Write short note on **any Four** : 20
- Intelligent agent: Types.
 - Depth Limited Search.
 - Resolution.
 - Support Vector Machine.
 - Perceptron.