



University of Barishal  
Department of Computer Science and Engineering  
Course Code: CSE-4101  
Course Title: Artificial Intelligence  
4<sup>th</sup> Year 1<sup>st</sup> Semester  
Admission Session: 2016-2017

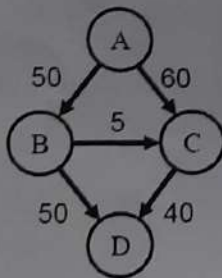
Time: 03 Hours

Marks: 60

Answer any FIVE questions out of the followings. All parts of each question must be answered consecutively. Right side of the question shows the maximum marks.

- ① a) Define Artificial Intelligence (AI). Describe Turing test approach. [3]  
b) Define Agent and Rational Agent through real time example [3]  
c) Distinguish between the following properties of a task environment: [3]  
i) Static or dynamic  
ii) Discrete or continuous  
iii) Single or multi-agent  
d) Briefly explain the PEAS description of the task environment for **an automated taxi, Part Picking Robot and Refinery Controller.** [3]

- ② a) Write short notes on agent type: [3]  
i) Simple reflex agents ii) Model-based reflex agents;  
b) Explain difference between uninformed and informed search. List two examples of each type of algorithm. Proof that Uniform-cost search is a special case of A\* search. [4]  
c) The state space description for a problem is shown below, with A being the start state and D being the goal state. Shown on the graph are path costs between states. The table lists the estimated distance from a state to the goal. Assume these estimates are admissible. Perform an A\* search for this problem, showing (i) the tree that represents the nodes expanded and (ii) the ordered list of nodes to expand at each step along with the node's f value. (That list starts with {A90}, showing A's f-value of 90.) Recall that  $f = g + h$ . (5)



Node	Estimated distance to goal
A	90
B	45
C	40
D	0

- ③ a) What do you mean by Adversarial Search. Solve 8-Queen problem using Genetic Algorithm or Hill-climbing search. [5]  
b) Explain Alpha-Beta Pruning Idea. Apply this idea for the following example. [3]  
c) Illustrates the Wumpus World problem along with its PEAS. [4]
4. a) Elaborate the following terms with example. [4]  
i) Horn clause ii) Modus ponens  
iii) Disjunctive normal form (DNF) iv) Conjunctive normal form (CNF)

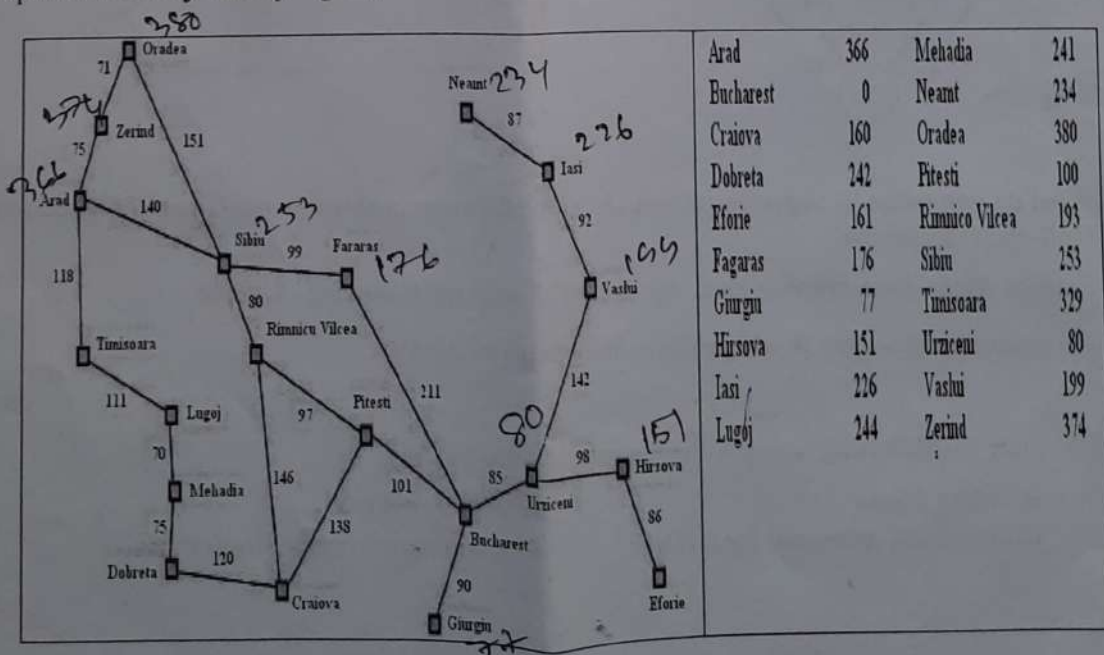
- b) Consider the following sentence:  $[(\text{Food} \Rightarrow \text{Party}) \vee (\text{Drinks} \Rightarrow \text{Party})] \Rightarrow [(\text{Food} \wedge \text{Drinks}) \Rightarrow \text{Party}]$ . [6]
- Determine, using enumeration, whether this sentence is valid, satisfiable (but not valid), or unsatisfiable.
  - Convert the left-hand and right-hand sides of the main implication into CNF, showing each step, and explain how the results confirm your answer to (i).
  - Prove your answer to (i) using resolution.
- c) Write down the Minimax Idea with its complexity. [2]

5. a) Define Probability with its types of Conditional Probability and Unconditional Probability. Write down the Axioms of Probability. [4]
- b) Explain forward chaining and backward chaining algorithms with example. [3]
- c) The probability that a student passes a Physics test is  $\frac{2}{3}$  and the probability that he passes both a Physics test and an English test is  $\frac{14}{45}$ . The probability that he passes at least one test is  $\frac{4}{5}$ . What is the probability that he passes the English test? [2]
- d) Differentiate among supervised, unsupervised and reinforcement learning? [3]

6. a) What is Bayesian reasoning? [2]
- b) How does an expert system rank potentially true hypothesis? Give an example [4]
- c) What is the certainty factor? How are belief and disbelief measured in certainty? [2+4]

7. a) How do the crossover and mutation operator work? Sketch the flow diagram of a genetic algorithm. [3+3]
- b) What are the differences between evolution and genetic algorithms? [2]
- c) What do you understand about Semantic Networks? Give an example of knowledge representation using Semantic Network. [2+2]

8. a) Short notes on: i) Tokenization ii) Stemming iii) Lemmatizing iv) TF-IDF Vectorize. [4]
- b) Explain "A\* search is both complete and optimal". Apply A\* search for Bucharest in the given graph the node's  $f$  value  $f = g + h$  [5]



- c) Describe Constraint Satisfaction Problem using graph coloring map example [3]

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