K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

Nov - Dec 2021

Program: B. Tech

Examination: LY Semester: VII

Course Code: 1UEXDLC703 and Course Name: Artificial Intelligence

Duration: 03 Hours

Max. Marks: 60

Instructions:

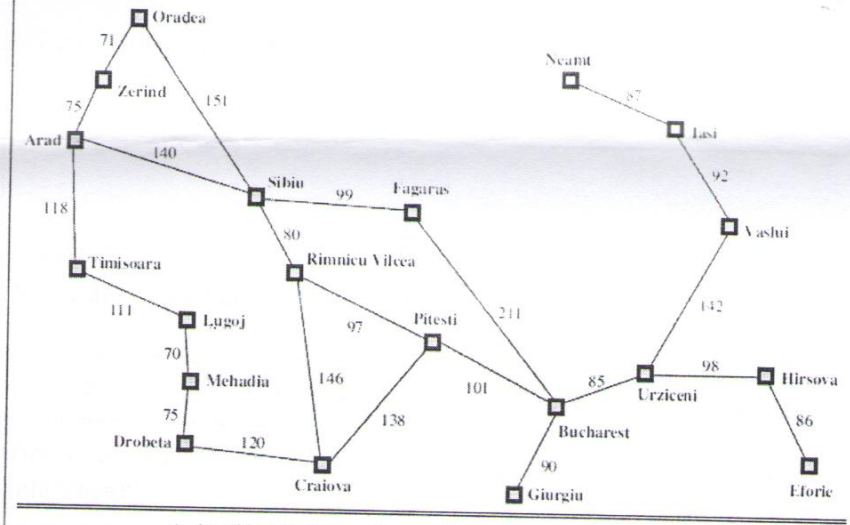
(1) All questions are compulsory.

(2) Draw neat diagrams wherever applicable.

(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight:**	**12**		
i)	What do you mean by Problem formulation? Explain by taking suitable example	**2**	**CO1**	U
ii)	Are reflex actions (such as flinching from a hot stove) rational? Are they intelligent?	**2**	**CO2**	U
iii)	In how many ways the algorithm's performance be evaluated.	**2**	**CO6**	U
iv)	Discuss the outline Algorithm of a knowledge-based agent program.	**2**	**CO3**	U
v)	What are Quantifiers in First-order logic.	**2**	**CO4**	U
vi)	Describe the important steps involved in planning.	**2**	**CO5**	U
vii)	Explain conditional probability with example.	**2**	**CO4**	U
viii)	Explain the general Tree-Search algorithm.	**2**	**CO3**	U
Q.2	**Solve any four questions out of six.**	**16**		

i)	Explain the agent program, its types and explain model-based reflex agent in detail with its schematic diagram and pseudocode with explanation for each step.	4	CO1	U
ii)	Explain Uniform cost search. Write its pseudocode with proper explanation for each step.	4	CO2	U
iii)	Consider the following sentence: [(Food ⇒ Party) ∨ (Drinks ⇒ Party)] ⇒ [(Food ∧ Drinks) ⇒ Party]. **a**. Determine, using enumeration, whether this sentence is valid, satisfiable (but not valid), or unsatisfiable. **b**. 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 (a).	4	CO4	A
iv)	Discuss the properties of forward and backward chaining methods.	4	CO3	U
v)	For each of the following statements, either prove it is true or give a counterexample. **a**. If P(a | b, c) = P(b | a, c), then P(a | c) = P(b | c) **b**. If P(a | b, c) = P(a), then P(b | c) = P(b) **c**. If P(a | b) = P(a), then P(a | b, c) = P(a | c)	4	CO5	U
vi)	Which of the following are true and which are false? Give brief explanations. **a**. In a fully observable, turn-taking, zero-sum game between two perfectly rational players, it does not help the first player to know what strategy the second player is using— that is, what move the second player will make, given the first player's move. **b**. In a partially observable, turn-taking, zero-sum game between two perfectly rational players, it does not help the first player to know what move the second player will make, given the first player's move.	4	CO6	U
Q.3	**Solve any two questions out of three.**	16		
i)	Describe the simple reflex Agents, its program along with its schematic diagram.	8	CO1	U
ii)	Describe Local search algorithm with appropriate diagram and Hill climbing search with its pseudo program.	8	CO2	U
iii)	Consider a vocabulary with the following symbols: Occupation (p, o): Predicate. Person p has occupation o. Customer (p1, p2): Predicate. Person p1 is a customer of person p2. Boss (p1, p2): Predicate. Person p1 is a boss of person p2. Doctor, Surgeon, Lawyer, Actor: Constants denoting occupations. Emily, Joe: Constants denoting people. Use these symbols to write the following assertions in first-order logic: **a**. Emily is either a surgeon or a lawyer. **b**. Joe is an actor, but he also holds another job. **c**. All surgeons are doctors. **d**. Joe does not have a lawyer (i.e., is not a customer of any lawyer). **e**. Emily has a boss who is a lawyer. **f**. There exists a lawyer all of whose customers are doctors. **g**. Every surgeon has a lawyer.	8	CO3	A

Q.4	**Solve any two questions out of three.**	**16**		
i)	Explain Forward Chaining with example and its proof with appropriate diagram	**8**	**CO4**	U
ii)	Describe Bayes' theorem and its application.	**8**	**CO5**	U
iii)	Suppose two friends live in different cities on a map, such as the Romania map shown in Figure below. On every turn, we can simultaneously move each friend to a neighbouring city on the map. The amount of time needed to move from city i to neighbour j is equal to the road distance d(i, j) between the cities, but on each turn the friend that arrives first must wait until the other one arrives (and calls the first on his/her cell phone) before the next turn can begin. We want the two friends to meet as quickly as possible. **a.** Write a detailed formulation for this search problem. (You will find it helpful to define some formal notation here.) **b.** Let D(i, j) be the straight-line distance between cities i and j. Which of the following heuristic functions are admissible? (i) D(i, j); (ii) 2 · D(i, j); (iii) D(i, j)/2. **c.** Are there completely connected maps for which no solution exists? **d.** Are there maps in which all solutions require one friend to visit the same city twice?  A simplified road map of part of Romania.	8	CO6	A