MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY / COMPUTER AND COMMUNICATION ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2017/JAN 2018

SUBJECT: PROGRAM ELECTIVE-I

ARTIFICIAL INTELLIGENCE [ICT 4009]

REVISED CREDIT SYSTEM
(01/01/2018)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer ALL the questions.

❖ Missing data, if any, may be suitably assumed.

1A. Write the pseudocode for A* search. Explain the conditions that are required for the optimality of A*. **5**

1B. Write the function for a goal based reflex agent. With a schematic diagram, explain how it chooses an action that will lead to the achievement of its goal. **3**

1C. Differentiate between the following properties of task environments.
   i) Fully observable vs partially observable.
   ii) Episodic vs sequential. **2**

2A. Give the problem definition for AND/OR graphs. Write the pseudocode for AO* algorithm. Clearly show how cost revision is done in AO* algorithm? **5**

2B. For a search tree, let b be the branching factor, d be the depth of the shallowest ("best") solution, and m be the maximum depth of the tree. Evaluate algorithms performance in terms of completeness, optimality, time and space complexity for:
   i) depth limited search.
   ii) iterative deepening search.
   iii) bidirectional search. **3**

2C. Write the procedure for alpha-beta pruning. **2**

3A. Define node and arc consistency for constraint propagation in constraint satisfaction problems. Write the pseudocode for arc consistency algorithm(AC-3). **5**

3B. Define the terms with respect to constraint satisfaction problem:
   i) Minimum remaining value heuristic.
   ii) Least constraining value heuristic.
   iii) Degree heuristic. **3**

3C. Explain the concept of forward checking. Use forward checking to color the graph given in Fig. Q.3C. Order of nodes for assignment is 2→3→4→5. Can we color the **2**

graphs using forward checking, such that no two adjacent nodes be colored with the same colors?
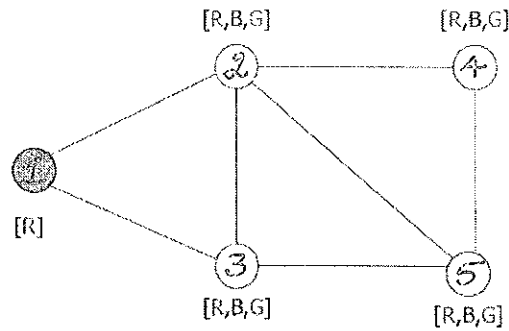

Fig. Q.3C

4A. Given the following, can you prove that the unicorn is mythical? How about magical? Horned?
If the unicorn is mythical, then it is immortal, but if it is not mythical then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it horned. 5

4B. Express the following statements in first-order logic.
   i) Paris and Marseilles are both in France.
   ii) There is a country that borders both Iraq and Pakistan.
   iii) All countries that border Ecuador are in South America. 3

4C. Prove using resolution that the following sentence entails G.
(A ∨ B) ∧ (~A ∨ C) ∧ (~B ∨ D) ∧ (~C ∨ G) ∧ (~D ∨ G) 2

5A. Consider a blocks world problem domain. Initially, block A is on the floor, block C is on block A and block B is on floor. The goal state is defined by block C on the floor, block B on block C and block A on block B. Using PDDL represent initial state, goal state and set of action schemas. 5

5B. What is planning graph? Write the pseudocode for GRAPHPLAN algorithm. 3

5C. Write any of the four Allen's interval relations. 2