

Time: 3 Hours

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)

END SEMESTER MAKE-UP EXAMINATIONS, JUNE 2019

SUBJECT: ARTIFICIAL INTELLIGENCE [CSE 4009]

REVISED CREDIT SYSTEM (14/06/2019)

MAX. MARKS: 50

2M

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitably assumed.
- **1A.** Define in your own words:

(a) Intelligence (b) Artificial intelligence (c) Agent (d) Rationality.

- 1B. Suppose you design a machine to pass the total Turing test. What are the capabilities 3M of such a machine? Explain.
- 1C. Describe the different types of task environments in which agent has to operate. 5M
- 2A. How the agent programs are different from software? With a neat block diagram explain model based reflex agents and goal based agents. 5M
- **2B.** List out different inference rules in propositional logic. Consider the following **5M** propositions and prove R using resolution.
 - $P \lor Q$ $P \to R$ $Q \to R$
- 3A. What are the differences between simple search and game search methods? Can Iterative deepening be used in game tree search? If yes, explain how, and what would be its advantages/disadvantages. If no, explain why not.
- 3B. Consider a graph shown in Figure 1, where S is the start node and G is the goal node. 2M Use Breadth-first search and Depth-first search techniques for tree traversal from start node to goal node. Show the contents of open and closed lists at each step.



- **3C.** Write a logically equivalent statement form for " $(q \leftrightarrow p) \land (\sim p \rightarrow q)$ " without using " \rightarrow " or " \leftrightarrow ". Then find a logically equivalent statement to your answer that is as simple as possible. Back up your statements with authorities(rules).
- **4A.** Write in first-order logic the assertion that
 - a. Every key will eventually be lost forever.
 - b. At least one of every pair of socks will eventually be lost forever,

Use only the following vocabulary: Key(x), x is a key; Sock(x), x is a sock; Pair (x, y), x and y are a pair; Now, the current time,Before(t1, t2), time t1 comes before time t2; Lost (x, t), object x is lost at time t.

4B. Give a representation in predicate logic of the following groups of propositions. For each group clearly define the domain of discourse and the predicate, function and constant symbols you intend to use.

(a) Horses, cows and pigs are mammals (b) The child of a horse is a horse

- (c) Bluebeard is a horse
- 4C. Consider the game tree shown Fig 2. Explore the tree using minimax and alpha-beta pruning. Indicate all parts of the tree that are cut off, and indicate the winning path or paths. Strike out all static evaluation values that do not need to be computed. Remember: each node is labeled with the range [alpha, beta], initially [-∞, +∞]. alpha = the lower bound of max's score; beta = upper bound of min's score. Consider the move from left to right.



Figure 2

5A. What is an ontology? Explain its importance.

2M

4M

5B. What are semantic networks? Draw a semantic network representing following **5M** knowledge:

"Every vehicle is a physical object. Every car is a vehicle. Every car has four wheels. Electrical system is a part of car. Car has Battery. Pollution system is a part of every vehicle. Vehicle is used in transportation. Honda Civic is a car; Nissan Sentra is also a car".

5C. What kinds of environment characteristics leads to an agent's uncertainty? What are **3M** reasons of uncertainty? Explain with an example.
