

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

END SEMESTER EXAMINATIONS, APRIL/MAY 2019

SUBJECT: ARTIFICIAL INTELLIGENCE [CSE 4009]

REVISED CREDIT SYSTEM (30/04/2019)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitably assumed.

- 1A. "AI is interdisciplinary in nature and its foundations are in various fields." Justify the 2M statement with valid reasons.
- 1B. What are the different representations to model the components of an agent program? 4M Briefly explain Simple reflex agents and Utility-based agents with an example representation under each type.
- In tabular form show PEAS description of Automated taxi driving system. Also 4M classify various properties of task environment for the above system. Support your answer with valid reasoning.
- 2A. With examples, explain what is a complete search algorithm and optimal search 2M algorithm? Does optimality entails completeness in searching?
- **2B.** Analyze BFS, DFS, and UCS search techniques with four performance measures. **3M**
- 2C. Refer Figure.1 implement following algorithm to find optimal path for each: 5M
 (a) Breadth-First search, (b) Uniform search, (c) Depth first search, d) Iterative deepening depth first search to find optimal path. Show traversed path from left, alphabetically.



Figure 1

- **3A.** Use truth tables to establish whether the following statement forms a tautology or a contradiction or neither. $((q^r)^{(-p^q)})^{(-p^q)}$
- 3B. Let's consider a propositional language where 1.P means "Paola is happy", 2.Q 3M means "Paola paints a picture", 3. R means "Renzo is happy". Construct valid argument using inference rules.
 - 1. "if Paola is happy and paints a picture then Renzo isn't happy"
 - 2. "if Paola is happy, then she paints a picture"

3. "Paola is happy only if she paints a picture"

- **3C.** What is the difference between a state and a node? Show it with an 8-puzzle example **4M** listing all the attributes.
- **4A.** Explain with an example, why propositional logic is a weak knowledge **2M** representation language?
- **4B.** Write the following assertions in first-order logic.
 - a. Any apartment in London has lower rent than some apartments in Paris.
 - b. There is exactly one apartment in Paris with rent below \$1000.
 - c. No person buys an expensive policy
 - d. There is an agent who sells policies only to people who are not insured
- 4C. Consider the following game tree (Figure 2) and assume that the first player is the maximizing player. Assuming that nodes are searched left-to-right using the alphabeta pruning algorithm, which nodes would not be examined? Also show the importance of move ordering in alpha-beta pruning.



- **5A.** With example mention basic relations for Categories.
- **5B.** Consider following knowledge, draw a semantic network. Explain the importance of **4M** inheritance in the representation.

"Every human, animal, and birds are living things who can breathe and eat. All birds can fly. Every man and woman are human who have two legs. A parrot is a bird and is green in color. A cat has fur and is an animal."

5C.

| | too thache | | $\neg toothache$ | |
|---|------------|--------------|------------------|--------------|
| | catch | $\neg catch$ | catch | $\neg catch$ |
| cavity | 0.108 | 0.012 | 0.072 | 0.008 |
| $\neg cavity$ | 0.016 | 0.064 | 0.144 | 0.576 |
| A full joint distribution for the Toothache, Cavity, Catch world. | | | | |

Figure 3

Given the full joint distribution shown in Figure 2, Calculate the following:

- a. **P** (toothache)
- b. **P** (Cavity)
- c. **P** (Toothache | cavity)



4M

2M

4M