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18CS71

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Artificial Intelligence and Machine Learning

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Artificial Intelligence. What are the applications of Artificial Intelligence? **(08 Marks)**
   b. A water jug problem states "You are provided with two jugs, first one with 4-gallon capacity and the second one with 3-gallon capacity. Neither have any measuring markers on it. How can you get exactly 2-gallons of water into 4-gallon jug?"
      i) Write down to production rules for the above problem.
      ii) Write any one solution to the above problem.   **(12 Marks)**

OR

2 a. Develop A* search algorithm for AI applications.   **(10 Marks)**
   b. Explain problem characteristics with respect to heuristic search.   **(10 Marks)**

Module-2

3 a. Explain the four approaches to knowledge representation.   **(10 Marks)**
   b. Discuss the following set of sentences into WFF in predicate logic and hence find the answer with proof for the question whether the Marcus is loyal to Caesar or not.
      i)   Marcus was a man.
      ii) Marcus was a Pompeian.
      iii) All Pompeian's were Romans.
      iv) Caesar was a ruler.
      v)   All Romans were either loyal to Caesar or hated him.
      vi) Everyone is loyal to someone.
      vii) People only try to assassinate rulers they are not loyal to.
      viii) Marcus tried to assassinate Caesar.
      ix) All mans are person.   **(10 Marks)**

OR

4 a. Write Find S Algorithm and discuss issues with the algorithm.   **(10 Marks)**
   b. Describe the Candidate Elimination algorithm. Find the maximum general hypothesis and maximum specific hypothesis for the training examples given in the table using candidate elimination algorithm.

Day	Sky	Air Temp.	Humidity	Wind	Water	Forecast	Enjoy Sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Warm	Change	Yes

                                                                                     (10 Marks)

Module-3

5 a. Define decision tree. Construct the decision tree to represent the following Boolean functions:
      i) $A \wedge \neg B$ ii) $A \vee [B \wedge C]$ iii) A XOR B   (06 Marks)
   b. Write the ID3 algorithm.   (08 Marks)
   c. What do you mean by gain and entropy? How it is used to build the decision tree? (06 Marks)

OR

6 a. Define artificial neural networks. Discover what are the appropriate problems for neural network.   (06 Marks)
   b. Define perceptron. Explain the concept of single perceptron with neat diagram.   (06 Marks)
   c. Explain the back propagation algorithm with example.   (08 Marks)

Module-4

7 a. What is Baye's theorem and maximum posterior hypothesis?   (05 Marks)
   b. Derive an equation for MAP hypothesis using Baye's theorem.   (05 Marks)
   c. Consider a football game between two rival teams: Team - A and Team - B. Suppose Team - A wins 95% of the time and Team - B wins the remaining matches. Among the games won by Team - A only 30% of them come from playing on Team – B's football field. On the other hand, 75% of the victories for Team - B are obtained while playing at home. If Team - B is to host the next match between the two teams which team will most likely emerge as the winner?   (10 Marks)

OR

8 a. Discuss the Naïve Baye's classifier.   (10 Marks)
   b. Discuss Minimum Description length principle in brief.   (10 Marks)

Module-5

9 a. Explain K-nearest neighbor learning algorithm.   (10 Marks)
   b. Define : i) Simple Error   ii) True Error.   (04 Marks)
   c. What is reinforcement learning?   (06 Marks)

OR

10 a. Explain locally weighted linear regression.   (10 Marks)
   b. Define expected value, variance standard deviation and estimate bias of a random variable.   (05 Marks)
   c. Explain Q-learning with example.   (05 Marks)

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