USN | | | | | | | | | | | 18CS71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. The water jug problem states : You are provided with two jugs, one with 4 gallons of capacity and the other one with 3 gallons of capacity. Neither have any measuring markers on it. How can we get exactly two gallons of water in 4 gallon jug?
   (i) Write down the production rules for the above problem.
   (ii) Write any one solution for the above problem.   **(08 Marks)**
   b. Explain Steepest Ascent Hill Climbing technique with an algorithm. Comment on its drawbacks and how to overcome these drawbacks.   **(12 Marks)**

OR

2 a. Explain problem reduction with respect to AND-OR graph with suitable example. **(07 Marks)**
   b. Write AO* algorithm.   **(07 Marks)**
   c. Discuss about constraint satisfaction and solve the below crypt arithmetic problem.
                CROSS + ROADS = DANGER   **(06 Marks)**

Module-2

3 Consider the following sentences :
   1. John likes all kinds of food
   2. Apples are food
   3. Chicken is food
   4. Anything anyone eats and isn't killed is food
   5. Bill eats peanuts and is still alive
   6. Sue eats every everything Bill eats.
   (i)   Translate these sentences into formulas in predicate logic.   **(05 Marks)**
   (ii) Prove that John likes peanuts using backward chaining.   **(05 Marks)**
   (iii) Convert the formulas of (i) into clause form.   **(05 Marks)**
   (iv) Prove John likes peanuts using resolution.   **(05 Marks)**

OR

4 a. Distinguish forward and backward reasoning with an example.   **(04 Marks)**
   b. Find maximally specific hypothesis for the training instances given below. Also write Find-S algorithm. The concept of this particular problem will be on what days does a person lines to go on walk.

Time	Weather	Temperature	Company	Humidity	Wind	Goes
Morning	Sunny	Warm	Yes	Mild	Strong	Yes
Evening	Rainy	Cold	No	Mild	Normal	No
Morning	Sunny	Moderate	Yes	Normal	Normal	Yes
Evening	Sunny	Cold	Yes	High	Strong	Yes

                                                                    (08 Marks)
   c. Define version space. Discuss the limitations of finds algorithm over candidate elimination algorithm.   **(08 Marks)**

Module-3

5   a. Explain the concept of decision tree learning. Write about attribute selection measure used to build the decision tree using ID3 algorithm. **(07 Marks)**
    b. How a single perceptron can be used to represent the Boolean functions such as AND, OR. **(06 Marks)**
    c. Write Gradient Descent algorithm to train a linear unit along with the derivation. **(07 Marks)**

OR

6   a. What do you mean by Gain and entropy? How it is used to build the decision tree. **(08 Marks)**
    b. Explain back propagation algorithm. Why is it not likely to be trapped in local minima? **(08 Marks)**
    c. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. **(04 Marks)**

Module-4

7   a. Explain Naïve Bayes classifier. **(08 Marks)**
    b. Explain Bayesian Belief network and conditional independence with example. **(08 Marks)**
    c. Let us assume dangerous fires are rare (1%) but smoke is fairly common (10%) due to barbecues, and 90% of dangerous fires make smokes. Find the probability of dangerous fire when there is smoke. **(04 Marks)**

OR

8   a. Discuss minimum description length principle in brief. **(08 Marks)**
    b. Explain brute force MAP learning algorithm. **(08 Marks)**
    c. Explain EM algorithm. **(04 Marks)**

Module-5

9   a. Explain k-Nearest neighbor learning algorithm. **(08 Marks)**
    b. Explain Locally weighted regression. **(08 Marks)**
    c. What is reinforcement learning? **(04 Marks)**

OR

10 a. Distinguish Eager learning vs Lazy learning algorithms. **(04 Marks)**
    b. Write short notes on Q-learning. **(08 Marks)**
    c. Discuss about Radial basis function in detail. **(08 Marks)**

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2 of 2