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18CS71

**Seventh Semester B.E. Degree Examination, June/July 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. Solve the water jug problem using production rule system. (10 Marks)  
 b. Develop AO\* algorithm for AI applications. (10 Marks)

**OR**

- 2 a. Explain the problem characteristics with respect to heuristic search. (10 Marks)  
 b. Write an algorithm for  
 i) Steepest-Ascent hill climbing with an example.  
 ii) Best first search with an example. (10 Marks)

**Module-2**

- 3 a. Write the candidate elimination algorithm. Explain its working, taking the enjoy sport concept and training instances given below.

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	Cool	Change	Yes

- b. Explain the Find-S algorithm and List-then-Eliminate algorithm with an example. (10 Marks)

**OR**

- 4 a. Explain the different approaches used for knowledge representation and list the issues in knowledge representation. (10 Marks)  
 b. Differentiate between forward and backward reasoning and list the factors that influences the choices between them. (10 Marks)

**Module-3**

- 5 a. Explain the concept of decision tree learning and discuss the necessary measures required to select the attributes for building a decision tree using ID3 algorithm. (10 Marks)  
 b. Construct the decision tree to represent the following Boolean functions:  
 i)  $A \wedge \neg B$     ii)  $A \vee [B \wedge C]$     iii)  $A \text{ XOR } B$ . (06 Marks)  
 c. Mention the appropriate problems for decision tree learning. (04 Marks)

**OR**

- 6 a. Explain the back propagation algorithm. (10 Marks)  
 b. Explain the perceptron network with the notation. Derive an equation of gradient descent rule to minimize the error. (10 Marks)

**Module-4**

- 7 a. Explain the Naïve Bayes classifier and Bayesian belief networks. (10 Marks)  
 b. Explain the MDL principle and Gibbs algorithm. (10 Marks)

**OR**

- 8 a. Explain the Bayes theorem and concept learning. (10 Marks)  
 b. Prove that how maximum likelihood (Bayesian learning) can be used in any learning algorithms that are used to minimize the squared error between the actual output hypothesis and predicted output hypothesis. (10 Marks)

**Module-5**

- 9 a. Explain the K-nearest neighbor learning algorithm with an example. (10 Marks)  
 b. Explain the locally weighted linear regression. (10 Marks)

**OR**

- 10 Write a short note on:  
 a. Q-learning  
 b. Radial basis function  
 c. Case based reasoning  
 d. The learning task. (20 Marks)

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