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## Seventh Semester B.E. Degree Examination, June/July 2024 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. Explain the designing of a learning system in detail. (10 Marks)
- b. Define learning. Specify the learning problem for handwriting recognition and robot driving. (05 Marks)
- c. Explain the issues in machine learning. (05 Marks)

**OR**

- 2 a. Write the steps involved in find-S algorithm. (05 Marks)
- b. Apply candidate elimination algorithm to obtain final version space for the training set shown in Table.Q2(b) to infer which books or articles the user reads based on keywords
- c. supplied in the article. (10 Marks)

Article	Crime	Academes	Local	Music	Reads
a <sub>1</sub>	True	False	False	True	True
a <sub>2</sub>	True	False	False	False	True
a <sub>3</sub>	False	True	False	False	False
a <sub>4</sub>	False	False	True	False	False
a <sub>5</sub>	True	True	False	False	True

Table.Q2(b)

State the inductive bias rote-learner, candidate-elimination and Find-S algorithm. (05 Marks)

### Module-2

- 3 a. Explain the concept of decision tree learning. Discuss the necessary measures required to select the attributed for building a decision tree using ID3 algorithm. (11 Marks)
- b. Explain the following with respect to decision tree learning :
  - i) Incorporating continuous valued attributes
  - ii) Alternative measures for selecting attributes
  - iii) Handling training examples with missing attribute values. (09 Marks)

**OR**

- 4 a. Construct decision tree using ID3 considering the following training examples :

Weekend	Weather	Parental availability	Wealthy	Decision class
H <sub>1</sub>	Sunny	Yes	Rich	Cinema
H <sub>2</sub>	Sunny	No	Rich	Tennis
H <sub>3</sub>	Windy	Yes	Rich	Cinema
H <sub>4</sub>	Rainy	Yes	Poor	Cinema
H <sub>5</sub>	Rainy	No	Rich	Home
H <sub>6</sub>	Rainy	Yes	Poor	Cinema
H <sub>7</sub>	Windy	No	Poor	Cinema
H <sub>8</sub>	Windy	No	Rich	Shopping
H <sub>9</sub>	Windy	Yes	Rich	Cinema
H <sub>10</sub>	Sunny	No	Rich	Tennis

Table Q4(b)

(12 Marks)

- b. Discuss the issues of avoiding overfitting the data, and handling attributes with differing costs. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Derive an expression for gradient descent rule to minimize the error. Using the same, write the gradient descent algorithm for training a linear unit. (10 Marks)  
 b. Write back propagation algorithm that uses stochastic gradient descent method. What is the effect of adding momentum to the network? (10 Marks)

**OR**

- 6 a. List the characteristics of the problems which can be solved using back propagation algorithm. (05 Marks)  
 b. Design a perceptron to implement two input AND function. (05 Marks)  
 c. Derive expressions for training rule of output and hidden unit weights for back propagation algorithm. (10 Marks)

**Module-4**

- 7 a. Explain Bayes theorem and mention the features of Bayesian learning. (07 Marks)  
 b. Prove that a maximum likelihood hypotheses can be used to predict probabilities. (08 Marks)  
 c. Explain Naïve Bayes classifier. (05 Marks)

**OR**

- 8 a. Describe MAP learning algorithm. (08 Marks)  
 b. Classify the test data and {Red, SUV, Domestic} using Naive Bayes classifier for the dataset shown in Table Q8(b).

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

Table Q8(b)

- c. Write and explain EM algorithm.

(06 Marks)

(06 Marks)

**Module-5**

- 9 a. Explain briefly on estimating hypothesis accuracy. (10 Marks)  
 b. Explain central limit theorem. (04 Marks)  
 c. Explain reinforcement learning with examples. (06 Marks)

**OR**

- 10 a. Explain K-Nearest neighbor learning algorithm and distance weighted nearest neighbor algorithm. (10 Marks)  
 b. Discuss on locally weighted regression. (05 Marks)  
 c. Write down the Q-Learning algorithm. (05 Marks)

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