

# CBCS SCHEME

USN

17CS73

**Seventh Semester B.E. Degree Examination, Jan./Feb. 2021**

## 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 machine learning. Mention five applications of machine learning. (06 Marks)
- b. Explain concept learning task with an example. (06 Marks)
- c. Apply candidate elimination algorithm and obtain the version space considering the training examples given Table Q1(c).

Eyes	Nose	Head	Fcolor	Hair?	Smile?(TC)
Round	Triangle	Round	Purple	Yes	Yes
Square	Square	Square	Green	Yes	No
Square	Triangle	Round	Yellow	Yes	Yes
Round	Triangle	Round	Green	No	No
Square	Square	Round	Yellow	Yes	Yes

Table Q1(c)

(08 Marks)

**OR**

- 2 a. Explain the following with respect to designing a learning system :
  - i) Choosing the training experience
  - ii) Choosing the target function
  - iii) Choosing a representation for the target function. (09 Marks)
- b. Write Find-S algorithm. Apply the Find-S for Table Q1(c) to find maximally specific hypothesis. (06 Marks)
- c. Explain the concept of inductive bias. (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)

**Module-3**

- 5 a. Discuss the application of neural network which is used to steer an autonomous vehicle. (06 Marks)
- b. Write Gradient descent algorithm to train a linear unit along with the derivation. (08 Marks)
- c. Discuss the issues of convergence, local minima and generalization, overfitting and stopping criterion. (06 Marks)

OR

- 6 a. List the appropriate problems for neural network learning. (05 Marks)
- b. Define perceptron and discuss its training rule. (05 Marks)
- c. Show the derivation of back propagation training rule for output unit weights. (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. Define :
- Sample error
  - True error
  - Confidence intervals.
- b. Explain K-nearest neighbor learning algorithm. (08 Marks)
- c. Write a note on Q-learning. (06 Marks)

(06 Marks)  
(08 Marks)  
(06 Marks)

OR

- 10 a. Define mean value, variance, standard deviation and estimation bias of a random variable. (04 Marks)
- b. Explain locally weighted linear regression and radial basis functions. (10 Marks)
- c. What is reinforcement learning? How it differs from other function approximation tasks? (06 Marks)

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