

**Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Machine Learning**

Time: 3 hrs.

Max. Marks: 80

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

**Module-1**

- 1 a. What do you mean by well-posed learning problem? Explain with example. (04 Marks)  
 b. Explain the various stages involved in designing a learning system in brief. (08 Marks)  
 c. Write Find\_S algorithm and discuss the issues with the algorithm. (04 Marks)

**OR**

- 2 a. List the issues in machine learning. (04 Marks)  
 b. Consider the given below training example which finds malignant tumors from MRI scans.

Example	Shape	Size	Color	Surface	Thickness	Target concept
1	Circular	Large	Light	Smooth	Thick	Malignant
2	Circular	Large	Light	Irregular	Thick	Malignant
3	Oval	Large	Dark	Smooth	Thin	Benign
4	Oval	Large	Light	Irregular	Thick	Malignant
5	Circular	Small	Light	Smooth	Thick	Benign

Show the specific and general boundaries of the version space after applying candidate elimination algorithm. (Note: Malignant is +ve, Benign is -ve). (08 Marks)

- c. Explain the concept of inductive bias in brief. (04 Marks)

**Module-2**

- 3 a. Discuss the two approaches to prevent over fitting the data. (08 Marks)  
 b. Consider the following set of training examples:

Instance	Classification	$a_1$	$a_2$
1	1	1	1
2	1	1	1
3	0	1	0
4	1	0	0
5	0	0	1
6	0	0	1

- (i) What is the entropy of this collection of training examples with respect to the target function classification?  
 (ii) What is the information gain of  $a_2$  relative to these training examples? (08 Marks)

**OR**

- 4 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)  $A \text{ XOR } B$  (06 Marks)  
 b. Write the ID3 algorithm. (06 Marks)  
 c. What do you mean by gain and entropy? How it is used to build the decision tree. (04 Marks)

**Module-3**

- 5 a. Define perceptron. Explain the concept of single perceptron with neat diagram. (06 Marks)  
b. Explain the back propagation algorithm. Why is it not likely to be trapped in local minima? (10 Marks)

**OR**

- 6 a. List the appropriate problems for neural network learning. (04 Marks)  
b. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. (08 Marks)  
c. Write a remark on representation of feed forward networks. (04 Marks)

**Module-4**

- 7 a. Explain Naïve Bayes classifier. (08 Marks)  
b. Explain brute force MAP learning algorithm. (08 Marks)

**OR**

- 8 a. Discuss Minimum Description Length principle in brief. (08 Marks)  
b. Explain Bayesian belief networks and conditional independence with example. (08 Marks)

**Module-5**

- 9 a. Define: (i) Simple Error (ii) True Error (04 Marks)  
b. Explain K-nearest neighbor learning algorithm. (08 Marks)  
c. What is reinforcement learning? (04 Marks)

**OR**

- 10 a. Define expected value, variance, standard deviation and estimate bias of a random variable. (04 Marks)  
b. Explain locally weighted linear regression. (08 Marks)  
c. Write a note on Q-learning. (04 Marks)