

Seventh Semester B.E. Degree Examination, June/July 2023 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. Explain with examples, why Machine Learning is important. (06 Marks)
- b. Describe the following problems with respect to Task, Performance and Experience.
- a) A Checkers learning problem.
- b) A Handwritten recognition learning problem.
- c) A Robot driving learning problem. (06 Marks)
- c. Write FIND – S Algorithm and explain with example given below :

Example	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

(08 Marks)

OR

- 2 a. Explain in detail the Inductive Bias of Candidate Elimination algorithm. (08 Marks)
- b. Write the Candidate Elimination algorithm and illustrate with example. (12 Marks)

Module-2

- 3 a. Explain representation of decision tree with example. (04 Marks)
- b. Describe the ID3 Algorithm for decision tree learning with example. (10 Marks)
- c. What are issues in learning decision trees? (06 Marks)

OR

- 4 a. Consider the following set of training examples :
- i) What is entropy of this collection of training example with respect to the target function classification?
- ii) What is the information gain of a_2 and a_1 relative to these training examples?

Instance	1	2	3	4	5	6	7	8	9
a_1	T	T	T	F	F	F	F	T	F
a_2	T	T	F	F	T	T	F	F	T
Classification	+	+	-	+	-	-	-	+	-

(12 Marks)

- b. Discuss Inductive Bias in Decision Tree Learning. (08 Marks)

Module-3

- 5 a. Explain the concept of a Perceptron with a neat diagram. (08 Marks)
- b. Write a note on :
- i) Perceptron training rule ii) Gradient descent and Delta rule. (08 Marks)
- c. Differentiate between Gradient Descent and Stochastic Gradient Descent. (04 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.

OR

- 6 a. Derive the Back Propagation Rule. (10 Marks)
 b. Define Maximum A Posteriori (MAP) and Maximum Likelihood (ML) Hypothesis. Derive the relation for h_{MAP} and h_{ML} using Bayesian Theorem. (10 Marks)

Module-4

- 7 a. Explain Brute Force Bayes concept learning. (06 Marks)
 b. Discuss Maximum Likelihood and Least Square Error Hypothesis. (06 Marks)
 c. Describe the concept of MDL. Obtain the equation for h_{MDL} . (08 Marks)

OR

- 8 a. Explain Naïve Bayes classifier with an example. (10 Marks)
 b. Explain the concept of EM Algorithm. Discuss what are Gaussian Mixtures. (10 Marks)

Module-5

- 9 a. Define the following terms :
 i) Sample error ii) True error iii) Random variable
 iv) Expected value v) Variance vi) Standard Deviation. (12 Marks)
 b. Explain K – Nearest Neighbor learning algorithm. (08 Marks)

OR

- 10 a. Explain Locally Weighted Linear Regression. (06 Marks)
 b. Write Reinforcement Learning problem characteristics. (06 Marks)
 c. Explain the Q Function and Q Learning Algorithm assuming deterministic rewards and actions with example. (08 Marks)
