

Model Question Paper

Seventh Semester B.E. Degree Examination (2021-22)

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Time: 03 Hours

Max Marks: 100

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

MODULE-1

- 1 a. **Define** Artificial Intelligence and list the task domains of Artificial Intelligence. (10 Marks)
 b. **State** and **explain** algorithm for Best First Search Algorithm with an example. (10 Marks)

OR

- 2 a. A Water Jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug
 (i) Write down the production rules for the above problem
 (ii) Write any one solution to the above problem (10 Marks)
 b. **Elaborate** the steps of Simulated Annealing. (10 Marks)

MODULE-2

- 3 a. **Describe** the issues of Knowledge Representation (10 Marks)
 b. Consider the following set of well-formed formulas in predicate logic

- (i) Man(Marcus)
 (ii) Pompeian(Marcus)
 (iii) $\forall x: \text{Pompeian}(x) \rightarrow \text{Roman}(x)$
 (iv) ruler(Caesar)
 (v) $\forall x: \text{Roman}(x) \rightarrow \text{loyalto}(X, \text{Caesar}) \vee \text{hate}(x, \text{Caesar})$
 (vi) $\forall x : \rightarrow y: \text{loyalto}(x,y)$
 (vii) $\forall x : \forall y : \text{man}(x) \wedge \text{ruler}(y) \wedge \text{tryassassinate}(x,y) \rightarrow \text{loyalto}(x,y)$
 (viii) tryassassinate (Marcus, Caesar)

Convert these into clause form and prove that hate (marcus, Caesar) using resolution proof

(10 Marks)

OR

- 4 a. **Recall** Concept Learning and also Explain hypothesis space of Find-S (05 Marks)
 b. **List** out the steps of Candidate Elimination Algorithm. Apply the algorithm to obtain the final version space for the training example

Ex.	Sky	Airtemp	Humidity	wind	Water	Forecast	Enjoy
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

(10 Marks)

c. **Compare** the key differences between Find-S and Candidate Elimination Algorithm.

(05 Marks)

MODULE-3

5 a. **Outline** the ID3 Decision Tree Learning method (08 Marks)

b. **Summarize** the appropriate problems for Decision Tree Learning method and also bring out the issues in decision tree learning (08 Marks)

c. **Construct** Decision trees to represent the following Boolean functions

(i) A and B

(ii) A or [B and C]

(iii) [A and B] or [C and D]

(04 Marks)

OR

6. a. For the transactions shown in the table compute the following:

(i) Entropy of the collection of transaction records of the table with respect to classification.

(ii) What is the information gain of A1 and A2 relative to the transactions of the table?

Instance.	Classification	A1	A2
1	+	T	T
2	+	T	T
3	-	T	F
4	+	F	F
5	-	F	T
6	-	F	T

(08 Marks)

b. **Discuss** the application of Neural Network which is used for learning to steer an autonomous vehicle.

(06 Marks)

- c. **Write** an algorithm for Back Propagation algorithm which uses stochastic gradient descent method. (06 Marks)

MODULE-4

7. a. **Illustrate** Bayes Theorem and maximum posterior hypothesis (06 Marks)
- b. The following dataset gives information about stolen vehicles using Naïve Bayes classifier classify the new data (Red,SUV,Domestic)

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

(08 Marks)

- c. **Outline** Brute force MAP Learning Algorithm (06 Marks)

OR

8. a. **Demonstrate** the derivation of K- Means Algorithm (10 Marks)
- b. Bring out the steps of Gibbs Algorithm (04 Marks)
- c. **Discuss** the Minimum Description Length algorithm (06 Marks)

MODULE-5

9. a. With a neat sketch briefly explain Global Approximation of Radial basis Function. (10 Marks)
- b. **Derive** the Gradient descent rule for a distance- weighted local linear approximation to the target function (10 Marks)

OR

10. a. **Discuss** the learning tasks and Q learning in the context of reinforcement learning (10 Marks)
- b. **Apply** K nearest neighbor classifier to predict the diabetic patient with the given features BMI, Age. If the training examples are

BMI	Age	Sugar
33.6	50	1
26.6	30	0
23.4	40	0
43.1	67	0
35.3	23	1
35.9	67	1
36.7	45	1
25.7	46	0
23.3	29	0
31	56	1

Assume $K=3$

Test Example

BMI=43.6, Age=40, Sugar=?

(10 Marks)