Sl. No.

CE1.2-R4 : MACHINE LEARNING

NOTE :
1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Total Time : 3 Hours   **Total Marks : 100**

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1. (a) What is machine learning ? Explain its application in different domains.

(b) Define Hypothesis space and its role in Inductive classification.

(c) Differentiate Bagging and Boosting techniques with a diagram.

(d) Explain architecture of Artificial Neural Network.

(e) Define various kernels used in Support Vector Machine.

(f) Explain different types of Learning.

(g) What is Logistic Regression ?   **(7x4)**

2. (a) What is the significance of activation functions in a neural network ? List the commonly used activation functions.

(b) Differentiate singlelayer and multi-layer networks with an example. Write a gradient descent training algorithm.

(c) What is overfitting and underfitting ? And how can they be reduced ?   **(6+8+4)**

3. (a) Convert the following sentences into formulas in propositional logic and then clause form :

(i) Jack likes all kinds of games.

(ii) Chess is a game.

(iii) Cricket is a game.

(iv) Anything anyone plays and isn't lost in a game.

(v) Jill plays cards and still wins.

(vi) Neal plays everything Jill plays.

(b) Also, draw the resolution graph for part (a).

(c) Translate the text : "*Every woman is beautiful. Laxmi is a woman. Therefore, Laxmi is beautiful*" into predicate calculus formula.   **(8+4+6)**

4. (a) Why are SVM models called Maximum Margin Linear Separators ?

(b) What are support vectors ? Explain Hard Margin and Soft Margin SVM.

(c) What is supervised machine learning ? Explain K-nearestneighbor algorithm. What are its advantages and disadvantages ?   **(4+6+8)**

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5. (a) What are the features of Bayesian learning ?

(b) Differentiate between generative and discriminative training models.

(c) Explain the candidate elimination algorithm with an example in detail.

(4+4+10)

6. (a) What is the bias-variance decomposition of classification error in ensemble learning ?

(b) What is concept learning as a search through hypothesis space ?

(c) What are the steps of statistical hypothesis testing ? Draw learning curves for machine learning.

(4+6+8)

7. (a) Define : (i) Predicate logic (ii) Propositional logic

(iii) Horn Clause (iv) Resolution

(b) Explain the steps to convert sentence to predicate logic and then horn clause with an example.

(c) What is inverse learning ?

(8+8+2)

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