

2025

MCA 3rd Semester Examination

MCA

Paper : MCA - 304

(Machine Learning)

Full Marks : 100

Time : Three Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any *five* questions : 2×5=10

1. Differentiate between Supervised Learning and Unsupervised Learning with one example each.
2. Write the formulas for mean and standard deviation of a dataset.
3. Differentiate between a Single Layer Neural Network and a Multilayer Neural Network.
4. What is a Neural Network? Mention any two key components of it.
5. Define Precision and Recall in the context of classification evaluation metrics.

P.T.O.

(2)

6. What is the main assumption made by the Naïve Bayes classifier?
7. State any two key steps involved in feature generation and explain their importance.
8. Define a Recurrent Neural Network (RNN).

Group - B

Answer any *four* questions : $15 \times 4 = 60$

9. Compare and contrast traditional programming and machine learning approaches with the help of a suitable example and diagram. What is dataframe? How is it handled by pandas in python with suitable example? Explain the purpose of sklearn and matplotlib library in machine learning with example. $5+2+3+(2\frac{1}{2}+2\frac{1}{2})$
10. Find linear regression equation for the following two sets of data :

x	2	4	6	8
y	3	7	5	10

Evaluate slope (m) and y-intercept (b). Hence find Sum of Square Error (SSE), Sum of Square Total (SST) and R-Squared (R^2). $(3+3)+(4+3+2)$

11. Given the following Golf Dataset, What is the probability that someone will not play golf given that the weather is (Outlook = Rainy, Temperature = Hot, Humidity = High, and Wind = Weak).

Outlook	Temperature	Humidity	Wind	Play Tennis
Sunny	Hot	High	Weak	No
Sunny	Hot	High	Strong	No
Overcast	Hot	High	Weak	Yes
Rain	Mild	High	Weak	Yes
Rain	Cool	Normal	Weak	Yes
Rain	Cool	Normal	Strong	No
Overcast	Cool	Normal	Strong	Yes
Sunny	Mild	High	Weak	No
Sunny	Cool	Normal	Weak	Yes
Rain	Mild	Normal	Weak	Yes
Sunny	Mild	Normal	Strong	Yes
Overcast	Mild	High	Strong	Yes
Overcast	Hot	Normal	Weak	Yes
Rain	Mild	High	Strong	No

Explain different types of Naïve Bayes classifiers. 8+7

12. Discuss the concepts of overfitting and underfitting in machine learning. Explain how cross validation helps in detecting and preventing overfitting. Provide an illustrative example. Compare linear SVM and non-linear SVM. Explain the concept of the kernel trick with examples of at least two different kernels.

4+4+4+3

P.T.O.

13. Discuss the concepts of Entropy, and Information Gain in the context of Decision Trees. Explain how these metrics are used to select the best split at each node. Compare Decision Trees with Random Forests. (3+3)+5+4
14. Explain the concept of Principal Component Analysis (PCA). Describe the step-by-step procedure for performing PCA on a dataset and how it helps in dimensionality reduction. What is the difference between feature selection and feature reduction? 4+7+4
15. Explain the structure of an Artificial Neural Network (ANN). Describe the roles of neurons, layers (input, hidden, output), weights, and activation functions in ANN. Compare ANN with biological Neuron. 5+(2+2+2)+4
16. Explain the concept of Deep Learning. Compare and contrast Deep Learning with traditional Machine Learning in terms of architecture, data requirements, and applications. Write short notes on structure and working of a Convolutional Neural Network (CNN). 3+5+7

Internal Assessment : 30 marks
