

National Forensic Sciences University
End-Semester Examination (100 Marks)
Course: Artificial Intelligence and Machine Learning
Time Allowed: 3 Hours

Instructions:

1. All questions are compulsory.
 2. The marks for each question are indicated in brackets.
 3. Assume suitable data wherever required.
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Question Paper

Section A (Short Questions, $5 \times 5 = 25$ Marks)

Unit-Wise Weightage: - Unit 1: 6 Marks - Unit 2: 6 Marks - Unit 3: 6 Marks - Unit 4: 3 Marks - Unit 5: 3 Marks

1. (Unit 1) Define AI and discuss its applications in real-world scenarios. (5)
2. (Unit 2) Differentiate between linear regression and logistic regression with examples. (5)
3. (Unit 3) Explain k -means clustering with an example. (5)
4. (Unit 4) Define activation functions in artificial neural networks. Provide examples. (5)
5. (Unit 5) Explain how AI/ML can be applied in cybersecurity. (5)

Section B (Medium-Length Questions, $5 \times 10 = 50$ Marks)

Unit-Wise Weightage: - Unit 1: 10 Marks - Unit 2: 10 Marks - Unit 3: 10 Marks - Unit 4: 10 Marks - Unit 5: 10 Marks

6. (Unit 1) Discuss the history of machine learning and its evolution. Highlight its significance in AI systems. (10)
7. (Unit 2) Explain the concept of overfitting and underfitting with examples. Discuss the role of regularization techniques like L1 and L2 in solving these issues. (10)
8. (Unit 3) Perform principal component analysis (PCA) on a dataset and explain its importance in dimensionality reduction. (10)
9. (Unit 4) Describe the structure of artificial neural networks. Explain backpropagation with mathematical expressions. (10)
10. (Unit 5) Discuss how machine learning is used to detect and mitigate Deepfake technologies. (10)

Section C (Long Questions, $2 \times 12.5 = 25$ Marks)

Unit-Wise Weightage: - Unit 1: 8 Marks - Unit 2: 8 Marks - Unit 3: 8 Marks - Unit 4: 4 Marks - Unit 5: 4 Marks

11. (Unit 1 2) Implement k -NN classification for the following data, and predict the class for the query point $[40, 50]$ when $k = 3$:

Brightness	Saturation	Class
50	50	Red
60	90	Blue
25	80	Red
40	20	Blue
70	70	Red

Discuss how accuracy is evaluated for k -NN models using evaluation metrics. (12.5)

12. (Unit 3, 4, 5) Build a decision tree for hiking habits using the given dataset. Use information gain as the splitting criterion. Then, explain how AI/ML can assist in anomaly detection for predictive maintenance systems.

Weekend?	Company	Weather	Go Hiking?
No	Friends	Sunny	Yes
Yes	Alone	Rainy	No
Yes	Family	Sunny	Yes
No	Friends	Rainy	No
Yes	Friends	Sunny	Yes

(12.5)