

Total No. of Questions : 8]

SEAT No. :

PE-2627

[Total No. of Pages : 3

[6583]-159

T.E. (Mechanical)

**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2019 Pattern) (Semester - VI) (302049)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, wherever necessary.
- 5) Use of electronic pocket calculators is allowed.

Q1) a) Describe the difference between decision trees and random forests, discuss advantages and disadvantages of using random forests over a single decision tree. [8]

b) Define the K-Nearest Neighbor (KNN) clustering algorithm. Explain how KNN differs from K-Means and discuss its key parameters. [9]

OR

Q2) a) Write a short note on : [8]

- i) Entropy
- ii) Information Gain

b) Given following dataset, Find out it is likely that *Blue Jeans from Brand X* would be on Sale Using Bayes Classifier. [9]

| Colour | Cloth Type | Brand | On Sale? |
|--------|------------|-------|----------|
| Blue | Jeans | Y | Yes |
| Blue | Shirt | X | No |
| Blue | Jeans | Y | Yes |
| Black | Jeans | Y | Yes |
| Black | Jeans | X | No |
| Black | Shirt | X | Yes |
| Black | Shirt | Y | Yes |
| Blue | Jeans | Y | No |
| Black | Jeans | X | Yes |
| Blue | Shirt | X | Yes |

P.T.O.

Q3) a) What is training data? What is labeled data? What is unlabeled data? What are key steps involved in developing training data? [8]

b) Explain different performance evaluators used for interpretation/assessment of classification models. Explain 2×2 confusion matrix and explain its terminology. Explain Cohen's Kappa, F Score, ROC Curve. [10]

- i) Accuracy
- ii) Precision
- iii) Recall
- iv) F1 Score

OR

Q4) a) From the below confusion matrix, determine accuracy, recall, precision, F1-score, True Positive Rate (TPR), False Positive Rate (FPR), True Negative Rate (TNR), and False Negative Rate (FNR). Interpret the Result. [10]

| | | Actual Values | |
|------------------|---|---------------|-----|
| | | 1 | 0 |
| Predicted Values | 1 | 540 | 150 |
| | 0 | 110 | 200 |

b) You are a data scientist working for a healthcare organization where a machine learning model has been developed to predict the risk of patients developing a specific medical condition based on their health indicators. The model's predictions were as follows: it correctly identified 350 cases as negative and 270 cases as positive. However, it misclassified 50 cases as negative when they were positive, and 30 cases as positive when they were negative. Prepare confusion matrix and calculate the following parameters to evaluate the model's performance i) Accuracy ii) Precision iii) Recall (Sensitivity) iv) F1-score Interpret the Result. [8]

Q5) a) Explain any five applications of reinforced and deep learning in mechanical engineering. [10]

b) Explain Convolution Neural Network (CNN) using a neat flow diagram. Discuss in brief different types of pooling and padding used in CNN. [8]

OR

- Q6) a)** A neuron with 4 inputs has the weights 0.3, 0.2, 0.1, 0.5 and bias 0. The activation function is linear, say the function $f(x) = 2x$. If the inputs are 0.8, 0.3, 0.2, 0.1 compute output and compare it with a neuron with same input parameters but with tanh and sigmoid activation function and interpret the result. [10]
- b) Explore value-based, policy-based, and model-based reinforcement learning approaches with examples. [8]

- Q7) a)** How deep learning can be used for image classification? [8]
- b) Explain in detail how machine learning is used for fault detection in the manufacturing industry. [9]

OR

- Q8) a)** Write a short note on use of AIML in tuning of control algorithms with example. [8]
- b) Explain in detail different applications of AIML. [9]