



**ME. DEGREE EXAMINATIONS: APRIL / MAY 2023**

(Regulation 2018)

Second Semester

**COMMUNICATION SYSTEMS**

P18AET2001: Machine Learning Techniques

**COURSE OUTCOMES**

**CO1:** Discuss the various learning methods.

**CO2:** Apply appropriate linear model for a given application.

**CO3:** Solve a given problem using probabilistic model.

**CO4:** Understand graphical models and choose appropriate one for specific application.

**CO5:** Review and employ the neural network-based learning algorithm.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Sequence the following steps for K-Means Clustering Algorithm CO3 [K<sub>1</sub>]
1. Recompute the centroids of newly formed clusters.
  2. Assign all the points to the closest cluster centroid.
  3. Select k random points from the data as centroids.
  4. Choose the number of clusters k.
  5. Repeat steps 3 and 4.
- a) 1,2,3,4,5 b) 1,3,2,4,5
- c) 5,4,3,2,1 d) 5,2,1,4,3
2. Identify the size of the set of instances for a set of all possible days, each described by CO1 [K<sub>3</sub>]  
the attributes given below.
- Sky – (values: Sunny, Cloudy, Rainy)
  - Air Temp – (values: Warm, Cold)
  - Humidity – (values: Normal, High)
  - Wind – (values: Strong, Weak)
  - Water – (values: Warm, Cold)
  - Forecast – (values: Same, Change)
- a) 96 b) 973
- c) 32 d) 5120





23. Explain in detail the Independent Component Analysis. Also list out its advantages and disadvantages. CO3 [K<sub>2</sub>]

24. Assume the 1st-order, ergodic Markov model, M. representing the state of the weather with the following states. CO4 [K<sub>3</sub>]

State 1: rain; State 2: cloud; State 3: sun;

The matrix with state-transition probabilities is given below.

$$A = \{a_{ij}\} = \begin{bmatrix} 0.4 & 0.3 & 0.3 \\ 0.2 & 0.6 & 0.2 \\ 0.1 & 0.1 & 0.8 \end{bmatrix}.$$

Given today is sunny (i.e.,  $x_1 = 3$ ), what is the probability with model M of directly observing the sequence of weather states “sun-sun-rain-cloud-cloud-sun”?

25. Outline the perceptron learning algorithm. What are its limitations? CO5 [K<sub>3</sub>]

26. Explain the basic principle of back- propagation learning. Discuss the advantages and disadvantages of the same. CO5 [K<sub>3</sub>]

**Answer any FOUR Questions**  
**PART D (4 x 10 = 40 Marks)**

27. Explain in detail the concept and elements of Reinforcement Learning. CO1 [K<sub>2</sub>]

28. Summarize the following Linear Models for Classification. CO2 [K<sub>2</sub>]  
1. Discriminant functions 2. Probabilistic generative models

29. Apply K-means clustering algorithm to group the following data into two groups. CO3 [K<sub>3</sub>]

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

30. Examine how you draw a decision tree for the following data which has 3 features and 2 output classes using 1.Information Gain 2.Gini Index. CO4 [K<sub>3</sub>]

x	y	z	class
1	1	1	1
1	1	0	1
0	0	1	2
1	0	0	2

31. Illustrate the various layers of a convolutional neural network. Also, explain the use and working of all layers. CO5 [K<sub>3</sub>]

\*\*\*\*\*