Register No.: …… Name: ……..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022

(COMPUTER SCIENCE & SYSTEM ENGINEERING)

(2021 Scheme)

Course Code : **21SE105-D**

Course Name: **Foundations of Machine Learning Techniques**

Max. Marks : **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Illustrate Naïve Bayes classification with an example.
2. Compare classification and prediction with an example.
3. What is the significance of Gaussian Mixture Model as a clustering method?
4. List any three applications of the kernel ICA.
5. Write the first-order optimality condition for an optimization problem.
6. Compare stochastic gradient descent and mini-batch stochastic gradient descent.
7. What is the significance of strides in CNN?
8. Differentiate RNN and LSTM.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. a) A coin is flipped 100 times. Given that there were 45 heads, find the maximum likelihood estimate for the probability p of heads on a single toss. (3)
   b) How does classification work based on Bayes theorem? (3)

OR

10. Discuss maximum likelihood method for predicting probabilities in Bayesian learning. (6)

MODULE II

11. a) Why is kNN algorithm called as a lazy learner? (3)
    b) Find which attribute can be chosen as the root for the decision tree classification, given dataset of 'Emotions' with attributes; crying, smiling. Justify your answer. (3)

Sl. No	Crying	Smiling	Emotion
1	T	T	Happy
2	T	T	Happy
3	T	F	Sad
4	F	F	Happy
5	F	T	Sad
6	F	T	Sad

OR

12. a) Demonstrate perceptron learning with an example. (3)
    b) What do you mean by slack variable? How is cost function calculated using slack variables? (3)

MODULE III

13. a) Write the steps for dimensionality reduction using Principal Component Analysis (PCA) on a given dataset. (3)
    b) Given the following data, compute the principal component vectors and the first principal components (3)

x1	4	8	13	7
x2	11	4	5	14

OR

14. Explain Expectation Maximization (EM) algorithm and its optimization technique. (6)

MODULE IV

15. Explain kernel PCA with an example and also write the various steps in kernel PCA. (6)

OR

16. Demonstrate the significance of spectral clustering and explain the algorithm. (6)

MODULE V

17. Explain constrained optimization using lagrangian approach with an example. (6)

OR

18. a) Demonstrate the method of solving soft-margin SVM. (3)
    b) How do binary classifiers solve multiclass problems? (3)

MODULE VI

19. a) Illustrate the training process of RNN. (3)
    b) What are the limitations of RNN? (3)

OR

20. Draw and explain the architecture of a convolutional neural network. (6)

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