**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**
**(Autonomous College Affiliated to University of Mumbai)**

~~Nov – Dec 2024~~ Jan / Feb 2025
(B. Tech ) Program: Computer Engineering Scheme II
Regular Examination :LY Semester: VII
03-02-25 Course Code: CEC701 and Course Name: Machine Learning
Date of Exam: ~~26/11/2024~~ Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

| Q. No. | Question | Max. Marks | CO | BT level |
|---|---|---|---|---|
| Q 1 | Solve any **two** questions out of three: (05 marks each) | 10 | | |
| a) | Write 5 applications of clustering. List 3 clustering algorithms. | | CO5 | U |
| b) | Differentiate Radial basis function and Multi-layer perceptron learning algo. | | CO4 | U |
| c) | How Bagging Ensembles technique works. Explain one Bagging algorithm with example. | | CO3 | U |
| Q 2 | Solve any **two** questions out of three: (05 marks each) | 10 | | |
| a) | How to evaluate the performance of machine learning models using K- fold cross validation. | | CO3 | U |
| b) | Define Optimal decision boundary, Margins, Support vectors and Kernel trick in SVM | | CO4 | U |
| c) | Apply the steps of Graph based clustering by taking suitable example and explain. | | CO5 | U |
| Q.3 | Solve any **two** questions out of three. (10 marks each) | 20 | | |
| a) | Illustrate about Rule based classification with suitable example. | | CO4 | U |
| b) | i) Apply Linear regression on given data and predict the expenditure with salary 4Lakh. (5mk)<br><br>Salary(x) \| Expenditure (y)<br>5 \| 25<br>1 \| 5<br>2 \| 7<br>1 \| 8<br>4 \| ?<br><br>ii) Explain the working of Logistic Regression with the help of Sigmoid function.(5mk) | | CO2 | Ap |

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| | | | | |
|---|---|---|---|---|
| c) | Apply LDA on 2D dataset<br>C1 = X1=(x1,x2)= { (4,1) (2,4) (2,3) (3,6)(4,6)}<br>C2= X2=(x1,x2)= {(9,10){6,8)(9,5)(8,7)(10,8)}<br>Compute within class scatter matrix (Sw) | | CO6 | Ap |
| Q.4 | Solve any **two** questions out of three. (10 marks each) | 20 | | |
| a) | Which feature will be at the root node of the decision tree trained for the following data? Solve using CART algorithm. | | CO3 | Ap |

| Height | Hair | Eyes | Attractive? |
|---|---|---|---|
| small | blonde | brown | No |
| tall | dark | brown | No |
| tall | blonde | blue | Yes |
| tall | dark | Blue | No |
| small | dark | Blue | No |
| tall | red | Blue | Yes |
| tall | blonde | brown | No |
| small | blonde | blue | Yes |

| | | | |
|---|---|---|---|
| b) | Explain with examples, what is the need of Training error, Generalization error and how to calculate. (5mk)<br>Explain with examples issues in machine learning (5mk) | CO1 | U |
| c) | Differentiate between Graph based, Model based, Density based clustering. Also give example of each. | CO5 | U |

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