CBCS SCHEME

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BCS602

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Machine Learning

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the machine learning process and its applications with a suitable diagram.	6	L2	CO1
	b.	Explain the purpose of dimensionality reduction and its importance in the domain of machine learning.	8	L2	CO1
	c.	Write short notes on the following : i) Min-Max Scaling ii) Z-score iii) Mean iv) Standard Deviation v) Median vi) Dispersion.	6	L2	CO1
		OR			
Q.2	a.	Explain the elements of Big Data, data types, and Big Data analytics in relation to Machine Learning.	6	L2	CO1
	b.	Explain data collection and data pre-processing.	8	L2	CO1
	c.	Explain the removal of noise or outlier data with a suitable example.	6	L2	CO1
		Module – 2			
Q.3	a.	Explain the Gaussian Elimination Algorithm and Solve the following problem $x + y + z = 2$ $x + 2y + 3z = 5$ $2x + 3y + 4z = 11$	10	L3	CO2
	b.	Explain the Types of Machine Learning (ML)	4	L2	CO2
	c.	Illustrate PCA, why it is important, and write the PCA Algorithm.	6	L3	CO2
		OR			
Q.4	a.	Solve the problem using the Find – S Algorithm :	10	L3	CO2

S. No	Horns	Tail	Tusks	Paws	Fur	Color	Hooves	Size	Elephant
1	No	Short	Yes	No	No	Black	No	Big	Yes
2	Yes	Short	No	No	No	Brown	Yes	Medium	No
3	No	Short	Yes	No	No	Black	No	Medium	Yes
4	No	Long	No	Yes	Yes	White	No	Medium	No
5	No	Short	Yes	Yes	Yes	Black	No	Big	Yes

	b.	Write a short note on Binomial Distribution, Poisson Distribution and Bernoulli Distribution.	4	L2	CO2
	c.	Explain LU Decomposition and solve the following problem $A = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 7 & 3 \\ 6 & 18 & 5 \end{bmatrix}$	6	L3	CO2
		Module – 3			
Q.5	a.	Explain the KNN algorithm and solve the following problem : In the KPSC exam, candidates secured the following marks. Based on those obtained marks, categorize whether the candidate is eligible for the exam or not using K-Nearest Neighbors. Given instance as follows : • General Studies X(O1) = 07 • Computer Science Y(O2) = 6 • Language = 4 • K = 3 nearest neighbors Note : Training data is provided, where O represents observable values.	10	L3	CO3

General Studies	Computer Science	Languages	Eligible
4	3	5	Fail
6	7	8	Pass
6	8	6	Pass
5	5	4	Fail
8	8	9	Pass

	b.	Explain the Local Weighted KNN, Logistic Regression, and Nearest centroid classifier algorithms.	10	L3	CO3
		OR			
Q.6	a.	Explain Linear Regression and Polynomial Regression and solve a Linear Regression problem : Apply linear regression technique to predict the 7th week sales	10	L3	CO3

Table : Sample data

X (week)	Y (Sales in Thousands)
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

	b.	Explain ID3 algorithm and solve the following problem :	10	L3	CO3

Age	Competition	Type	Profit
Old	Yes	S/W	Down
Old	No	S/W	Down
Old	No	H/W	Down
Mid	Yes	S/W	Down
Mid	Yes	H/W	Down
Mid	No	H/W	Up
Mid	No	S/W	Up
New	Yes	S/W	Up
New	No	H/W	Up
New	No	S/W	Up

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Module – 4

Q.7	**a.**	Explain Baye's Theorem and Bayes' optimal classifier.	**8**	**L2**	**CO4**
	b.	Explain the Naïve Bayes algorithm and solve the problem using the Naïve Bayes classifier. Classify using Naïve Bayes' for the new sample : (fruit = {yellow, sweet, long}) Data : Fruit | Yellow | Sweet | Long Orange | 350 | 450 | 0 Banana | 400 | 300 | 350 Others | 50 | 100 | 50	**12**	**L3**	**CO4**

OR

Q.8	**a.**	Write a note on : i) Perceptron ii) Different types of Artificial Neural Network with a suitable diagram.	**8**	**L2**	**CO4**
	b.	Explain the ANN Node structure and all its associated activation function with suitable mathematical notations.	**12**	**L2**	**CO4**

Module – 5

Q.9	**a.**	Write a short note on Clustering and classification along with advantages and disadvantages of the clustering algorithm.	**6**	**L2**	**CO5**
	b.	Explain the proximity measures.	**6**	**L2**	**CO5**
	c.	Explain the Mean Shift Clustering Algorithm and solve the following problem. Start with point P1(1, 1) P1 = (1, 1) P2 = (2, 1) P3 = (2, 2) P4 = (8, 8) P5 = (9, 8) P6 = (8, 9) Mean shift clustering using a bandwidth (radius) of 4 units. Stopping threshold : Stop when the new center moves less than 0.01	**8**	**L3**	**CO5**

OR

Q.10	**a.**	Explain the K-Mean clustering algorithm and solve the following problem. Point | X | Y A | 1 | 1 B | 1.5 | 2 C | 3 | 4 D | 5 | 7 E | 3.5 | 5 F | 4.5 | 5 G | 3.5 | 4.5 Lets apply K-Means with K = 2	**12**	**L3**	**CO5**
	b.	Short note on : Monte Carlo method, temporal difference learning, Q-learning and SARSA learning.	**8**	**L2**	**CO5**

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