

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

May-June 2025

Program: B. Tech Scheme IIB

Regular Examination: TY Semester: VI

Course Code: EXC602 and Course Name: Machine Learning

Date of Exam: 22/5/2025

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)	What are the types of Machine Learning? Explain the types in brief with examples.		1	U
b)	Perform a 5-fold Cross-Validation to evaluate a ML mode on the dataset with 10 samples.		4	U
c)	Explain various ML techniques for anomaly detection with appropriate diagrams.		6	U
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Explain the fundamental concept of Unsupervised Learning and its Key techniques with example.		1	U
b)	Define: (a) Accuracy (b) Precision (c) Recall (d) F1-Score (d) Specificity		6	U
c)	A machine learning model is used to detect a disease based on medical test results. It classifies patients as diseased (Positive) or Healthy (Negative). The model is tested on 200 patients, and the results are summarized in the confusion matrix below. Calculate Accuracy, Precision, Recall, False Positive Rate, False Negative Rate and F1 Score.. Actual \ Predicted Diseased (Positive) Healthy (Negative) Total Diseased (Positive) 50 (TP) 20 (FN) 70 Healthy (Negative) 10 (FP) 120 (TN) 130 Total 60 140 200		3	U
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Explain Principal Component Analysis with example and its appropriate graphical representations, step by step.		5	U

b)	<table><tr><td>y</td><td>1.45</td><td>1.93</td><td>0.81</td><td>0.61</td><td>1.55</td><td>0.95</td><td>0.45</td><td>1.14</td><td>0.74</td><td>0.98</td></tr><tr><td>x</td><td>0.58</td><td>0.86</td><td>0.29</td><td>0.2</td><td>0.56</td><td>0.28</td><td>0.08</td><td>0.41</td><td>0.22</td><td>0.35</td></tr><tr><td>z</td><td>0.71</td><td>0.13</td><td>0.79</td><td>0.2</td><td>0.56</td><td>0.92</td><td>0.01</td><td>0.6</td><td>0.7</td><td>0.73</td></tr></table> Calculate hypothesis, squared error value and updated parameter values using gradient descent. Let $\theta_0 = 0.434, \theta_1 = 1.653, \theta_2 = 0.0039$	y	1.45	1.93	0.81	0.61	1.55	0.95	0.45	1.14	0.74	0.98	x	0.58	0.86	0.29	0.2	0.56	0.28	0.08	0.41	0.22	0.35	z	0.71	0.13	0.79	0.2	0.56	0.92	0.01	0.6	0.7	0.73		2	A
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c)	Given the points P1(3, 7), P2(4, 6), P3(5, 5), P4(6, 4), P5(7, 3), P6(6, 2), P7(7, 2), P8(8, 4), P9(3, 3), P10(2, 6), P11(3,5) and P12(2,4) Find the core points and outliers using DBSCAN. Take Eps = 1.9 and MinPts = 4.	3	A																																		
Q.4	Solve any two questions out of three. (10 marks each)	20																																			
a)	Explain gradient descent in linear regression, steps required in its algorithm and cost function.		2	U																																	
b)	To solve a numerical example of agglomerative clustering, let us take the points A (1, 1), B (2, 3), C (3, 5), D (4,5), E (6,6), and F (7,5) and try to cluster them. give the detailed and step by step solution of this numerical		5	A																																	
c)	Given the data in table reduce the dimension from 2 to 1 using the Principal Component Analysis algorithm. <table><tr><td>Feature</td><td>Ex1</td><td>Ex2</td><td>Ex3</td><td>Ex4</td></tr><tr><td>X1</td><td>4</td><td>8</td><td>13</td><td>7</td></tr><tr><td>X2</td><td>11</td><td>4</td><td>5</td><td>14</td></tr></table>		Feature	Ex1	Ex2	Ex3	Ex4	X1	4	8	13	7	X2	11	4	5	14	4	A																		
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