

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

End Semester Examination: May – June 2026

Program: B. Tech (Information Technology)

Scheme: III

Regular / Supplementary Examination: TY

Semester: VI

Course Code: Machine Learning and Deep Learning

Course Name: ITDLC6031

Date of Exam: 22/05/2026

Duration: 2.5 Hours

Max. Marks: 60

Instructions:

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

Ques. No.	Question	Max. Marks	CO	BT Level																					
Q1	Solve <u>any two</u> questions out of three: (05 marks each)	10																							
a)	Sketch and explain Boosting approach of Ensemble-based Learning for Diabetes prediction.		2	A																					
b)	Explain Bias-Variance trade-off.		1	U																					
c)	An RGB image of size $6 \times 6 \times 3$ is processed using two filters of size $3 \times 3 \times 3$ with stride 1 and no padding. Find the output size.		4	A																					
Q2	Solve <u>any two</u> questions out of three: (05 marks each)	10																							
a)	Differentiate Case Updating and Epoch Learning.		3	A																					
b)	Explain the need of RNN for sequential data.		5	U																					
c)	Differentiate GANs and VAEs.		6	A																					
Q3	Solve <u>any two</u> questions out of three. (10 marks each)	20																							
a)	Apply GRU for time-series based temperature prediction using historical weather data and explain its architecture.		5	A																					
b)	Consider an image of size $32 \times 32 \times 256$ and apply a 7×7 convolution with 48 filters — with and without using a 1×1 convolution having 8 filters as an intermediate layer. Calculate the number of computations for both.		4	A																					
c)	Consider multilayer feed-forward neural network architecture with 3-2-1. Let the learning rate be 0.9. The initial weight and bias values of the network are given in the table below, along with the first training tuple, $X = (1, 0, 1)$, whose class label is 0. Calculate the net input, output and error of each unit in hidden and output layer once the tuple is fed into the network. Also show updated values of weights and bias after first iteration calculating the error. <table><tr><td>w14</td><td>w15</td><td>w24</td><td>w25</td><td>w34</td><td>w35</td><td>w46</td><td>w56</td><td>θ1</td><td>θ2</td><td>θ3</td></tr><tr><td>0.5</td><td>-0.1</td><td>0.2</td><td>0.4</td><td>-0.7</td><td>0.3</td><td>-0.3</td><td>0.2</td><td>0.4</td><td>0.2</td><td>0.1</td></tr></table>		w14	w15	w24	w25	w34	w35	w46	w56	θ1	θ2	θ3	0.5	-0.1	0.2	0.4	-0.7	0.3	-0.3	0.2	0.4	0.2	0.1	3
w14	w15	w24	w25	w34	w35	w46	w56	θ1	θ2	θ3															
0.5	-0.1	0.2	0.4	-0.7	0.3	-0.3	0.2	0.4	0.2	0.1															
Q4	Solve <u>any two</u> questions out of three. (10 marks each)	20																							
a)	Consider a dataset where a fraud detection system collects information on		2	A																					

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	transactions made by users:						
	Transaction Type	Transaction Amount	Account Status	User Location			Attack Outcome
	Withdrawal	High	Active	USA			No
	Deposit	High	Inactive	Canada			Yes
	Transfer	High	Active	UK			No
	Deposit	Medium	Active	Australia			Yes
	Withdrawal	Low	Inactive	India			No
	Transfer	Low	Active	USA			Yes
The fraud detection expert applies Boosting approach of Ensemble Learning with Decision Trees as the base classifier. Assume that the last two instances were misclassified by the first trained classifier. Calculate the weights of the instances for training of the 2 nd classifier using AdaBoost.							
b)	Apply GANs for healthcare and explain the generic architecture of GANs.				6	A	
c)	Sketch and explain various Probability Distribution Functions				1	U	
