BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : II**
BRANCH: AI & ML **SESSION : SP/2025**

SUBJECT: AI601 CONCEPTS OF DEEP LEARNING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a	How do you compare traditional machine learning algorithms with deep learning algorithms? Explain overfit and underfit concepts with the help of a diagram	[5]	1	1,2
Q.1(b	a) Find the final equations for a feedforward network with a single hidden layer, which takes an input vector x, a vector of real numbers of dimension n0, outputs a probability distribution y, and is parameterized by weight matrices W and U and a bias vector b. W is the weight matrices between the input and hidden layer. U is the weight matrices between the hidden and output layers. You have given the following $x \in Rn0$, $h \in Rn1$, $b \in Rn1$, $y \in Rn2$ $W \in Rn1xn0$, $U \in Rn2xn1$ Using a non-linear activation function σ(.) in the hidden layer and softmax in the output layer, write the equation that computes the output y in terms of x, W, U, b, and the activation function. b) Find the undecided band for the perceptron OR from the results obtained. At the end of the training, the weights and bias are w1 = 2, w2 = 2, and b = −1 The threshold for the network is set at 0.5	[2.5X2]	1	3
Q.2(a	How do we make a difference between Nominal attributes and ordinal values? Explain standardization normalization techniques with the help of an example	[2, 3]	2	1,2
Q.2(b	a) How do you handle the dataset's missing values and dirty data? Find the following dissimilarity between binary variables from the given table a) d(Raj, Reena) b) d(Raj, Sulieman) c) d(Suleiman, Reena)	[2, 3]	2	3

Name	Gender	Fever	Cough	Test-1	Test-2	Test-3	Test-4
Raj	M	Y	N	P	N	N	N
Reena	F	Y	N	P	N	P	N
Suleiman	M	Y	P	N	N	N	N

Q.3(a	Why are CNNs preferred over fully connected networks for image classification tasks? What are the roles of the following components in a CNN? a) Convolution layer b) Activation function c) Pooling Layer d) Fully connected layer	[1X5]	3	1,2

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Q.3(b	a) What hyperparameters control the size and depth of the output volume? b) How does the computer see the grayscale and color images? c) How do neural networks distinguish useful features from non-useful features? d) Find the output of the following a) input starts with 227 × 227 × 3 images, Kernal size = 11, Stride =4, number of filter =96 b) input size= 13, Kernal size=3, stride = 1, padding = same	[1X5]	3	3
Q.4(a	Drive the gradient of the loss Lt with respect to the output weight matrix V.	[5]	4	3
Q.4(b	What do you mean by "unrolling" an RNN during forward propagation? Explain it with the help of diagram. Why is weight sharing important in an RNN?	[3,2]	4	1,2
Q.5(a	Explain briefly about input, output, forget gates, candidate states, and cell states of long short-term memory networks with the help of equations and diagrams.	[5]	5	1,2
Q.5(b	How do you compare LSTM with GRU? Explain character-level prediction using RNN with the help of examples and diagrams.	[2, 3]	5	2,3

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