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

CLASS: B.Tech **SEMESTER : VII**
BRANCH: CSE **SESSION : MO/2025**

SUBJECT: CS437 DEEP LEARNING

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Explain the 'No Free Lunch' theorem in the context of machine learning.	[2]	1	2
Q.1(b)	What is meant by the "capacity" of a machine learning model? Explain the relationship between model capacity, underfitting, and overfitting. Illustrate your answer with a neat diagram.	[3]	1	2
Q.2(a)	What is meant by "bias" in a machine learning algorithm? Why is it important? Explain your answer with a suitable example.	[2]	1	2
Q.2(b)	Explain how *Maximum Likelihood Estimation (MLE)* is used to estimate the parameters of a probability distribution model.	[3]	1	2
Q.3(a)	Differentiate between a McCulloch–Pitts neuron and a perceptron?	[2]	3	4
Q.3(b)	Write the Perceptron Learning Algorithm. Explain the relationship between the positive samples and the weight vector W in a linearly separable two-class problem.	[1+2]	3	1,2
Q.4(a)	If Feedforward Networks are universal approximators, why not use a single hidden layer with a large number of neurons instead of deeper networks?	[2]	3	4
Q.4(b)	How can a network of perceptrons be used to solve non-linear problems? Explain with a suitable example.	[3]	3	2
Q.5(a)	Why is the gradient of the cost function important in backpropagation?	[2]	3	2
Q.5(b)	Given an cost function, $C = \frac{1}{2}(y-a)^2$, derive the weight update formula using backpropagation for one neuron. Here, 'y' denotes the actual output and 'a' represents predicted output.	[3]	3	3

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