

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

CLASS: BCA
BRANCH: BCA

SEMESTER : VI
SESSION : SP/2025

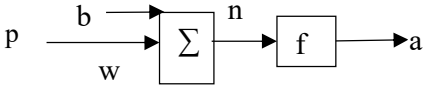
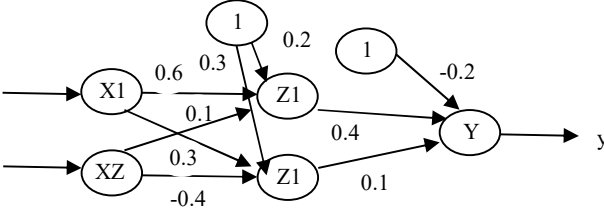
SUBJECT: CA369 DEEP LEARNING

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) Define bias, variance, and bias-variance trade-off. Explain how hyperparameters influence model performance. | [5] | 1 | 1 |
| Q.1(b) Describe Bayesian classification with suitable example. | [5] | 1 | 3 |
| Q.2(a) Consider the following neuron and sketch the neuron response (a versus p for $2 \leq p \leq 2$) for the following cases: a) $w=1, b=1, f=\text{symmetrical hard limit}$ b) $w= -1, b=1, f=\text{symmetrical hard limit}$. | [5] | 2 | 2 |
|  | | | |
| Q.2(b) Comment on the issue with classification of binary XOR pattern and illustrate the role of multilayer neural network in classifying this pattern. | [5] | 2 | 3 |
| Q.3(a) Using back-propagation network, find the new weights for the net shown in Fig.1. It is presented with the input pattern [0, 1] and the target output is 1. Use a learning rate $\alpha=0.25$ and sigmoidal transfer function. | [5] | 3 | 2 |
|  | | | |
| Q.3(b) Consider a dataset where a binary classification is to be performed. Given a simple dataset and the Perceptron Learning Algorithm, perform two iterations of the algorithm and compute the updated weights. | [5] | 3 | 4 |
| Q.4(a) Explain the role of a kernel filter and pooling in Convolutional Neural Networks. Illustrate with a 3×3 kernel example. | [5] | 4 | 3 |
| Q.4(b) Which among the encoder, decoder or encoder-decoder architectures can be used for data compression. Provide justification with a simple sketch of the architecture. | [5] | 4 | 3 |
| Q.5(a) Explain the concept of Attention in a Transformer architecture. | [5] | 5 | 3 |
| Q.5(b) Briefly explain the steps of sentiment analysis. Analyze whether a deep learning model can make the process more efficient. | [5] | 5 | 4 |