

Course Name: Neural Networks**Course Outcome**

- CO1- Understand the differences between networks for supervised and unsupervised learning
 CO2- Design single and multi-layer Perceptron neural networks, activation functions
 CO3- Understand Back Propagation Non-Linear Neural network architecture
 CO4- Understand Convolutional Neural Network and Recurrent Neural Network

Printed Pages: 03**University Roll No.****Mid Term Examination, Even Semester 2023-24****B. TECH (AIML), 3rd Year, VIth Semester****Subject Code & Subject Name- BCSC0706: Neural Networks****Time: 2 Hours****Maximum Marks: 30****Section – A***Attempt All Questions***3 X 5 = 15 Marks**

No.	Detail of Question	Marks	CO	BL	KL
1	You are designing a discrete perceptron for a binary classification task. The perceptron is currently in the training phase, and you want to understand how the weights are updated during the learning process. Develop a step-by-step explanation of the weight update equation for the discrete perceptron, considering the activation function and the learning rate. Justify the significance of each term in the equation.	3	3	E	P
2	You are working on a project involving neural networks and need to choose between implementing a static neural network and a dynamic neural network. Provide a detailed distinction between static and dynamic neural networks, emphasizing their characteristics and applications.	3	1	U	C
3	Prove that SoftMax activation function is differentiable and compute its derivative with respect to an input	3	2	An	C
4	"Explain the process of feedforward and backward propagation in the context of training a neural network for image classification tasks."	3	3	U	C
5	You are guiding a team of junior data scientists who are relatively new to neural network training. During a team meeting, one of the members asks	3	3	E	P

	about the role of Gradient Descent in training neural networks. Develop a scenario-based explanation to help your team understand how Gradient Descent contributes to the training process. Use practical examples and highlight its significance in optimizing model parameters.				
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Section – B

Attempt All Questions

5 X 3 = 15 Marks

No .	Detail of Question	Ma rks	C O	BL	K L
6	Compare and contrast the ADALINE (Adaptive Linear Neuron) and MADALINE (Multiple ADALINE) networks in terms of their structure, learning algorithms, and applications. Additionally, discuss how the incorporation of multiple ADALINE units in the MADALINE network enhances its performance compared to a single ADALINE unit. Provide examples to illustrate the distinct applications and advantages of each network type in solving real-world problems.	5	2	R	C
7	A team of researchers is exploring the application of early neural network models in solving simple computational tasks. They are particularly interested in McCulloch and Pitts' model of artificial neurons. In what practical scenarios could the McCulloch and Pitts model of artificial neurons be applied to solve basic computational problems? Provide examples of tasks where this model could demonstrate its utility and limitations.	5	2	An	F

For the neural network shown in Fig. 1, let the input vector $[x_1, x_2]$ be $[0.2, 0.7]$ and the output vector $[y_1, y_2]$ be $[0.1, 0.9]$. Similarly, the bias vector corresponding to b_1 is $[0.5, 0.5, 0.5]$ and b_2 is $[0.5, 0.5]$, whereas the initial weights are $[0.4, 0.25, 0.35, 0.5, 0.3, 0.4, 0.3, 0.35, 0.2, 0.5, 0.25, 0.4]$. Let the sigmoid function $S(z) = \frac{1}{1+e^{-z}}$ be the activation function for each neuron. Moreover, assume that the mean squared error function is used to compute the error. Let $\eta=0.3$ be the learning rate. [All questions are with respect to one forward and corresponding backward pass.]

Note: Find values up to 4 decimal places.

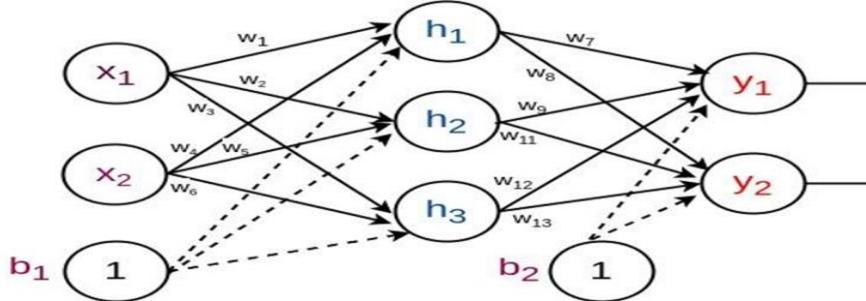
8

5

3

E

P



1. The output of node h_2 would be
2. Input to the node y_1 would be
3. The output of node y_2 would be
4. The error observed in the values of y_1 is
5. The updated weight corresponding to w_8 would be