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

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Carryover Examination, Even Semester, 2024-25
B. TECH (AIML), 3rd Year, VIth Semester
BCSC0706: Neural Networks

Time: 3 Hours   **Maximum Marks: 80**

Instruction for students: Calculator is prohibited

Section – A

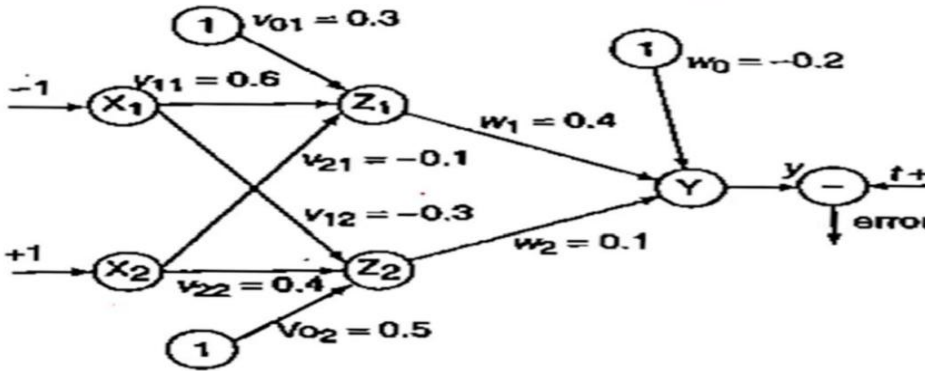*Attempt **All** Questions*   3 X 8 = 24 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	How does Gradient Descent contribute to training neural networks?	3	3	E	P
2	How do the fundamental differences between supervised and unsupervised learning influence the choice of algorithms, and in what scenarios would one be preferred over the other?	3	1	U	C
3	How does the choice of weights and threshold in the McCulloch-Pitts model influence the correct implementation of the AND function, and how would modifications to these parameters affect its behavior?	3	2	An	C
4	Prove that SoftMax activation function is differentiate and compute its derivative with respect to an input	3	2	An	C
5	Compare and contrast the ADALINE (Adaptive Linear Neuron) and MADALINE (Multiple ADALINE) networks in terms of their structure, learning algorithms, and applications.	3	2	U	C
6	Suppose below table represents the confusion matrix. Determine Precision, Recall, Error rate?	3	4	An	P
7	" Can you explain the process of backpropagation in training a neural network for image classification?"	3	3	U	C

Confusion matrix (Question 6):

	NO	YES
NO	55	15
YES	10	105

No.	Detail of Question	Marks	CO	BL	KL
8	How does linear regression model the relationship between variables, and what limitations arise when this relationship is not strictly linear? How can residual plots help assess model adequacy?	3	4	U	C

Section – B

*Attempt **All** Questions*   6 X 6 = 36 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	How do Convolutional Neural Networks (CNNs) process and extract features from images to improve accuracy in deep learning tasks?	6	4	An	P
2	Try to solve numerical using back propagation algorithm including sigmoid activation function with learning rate is 0.25 and target is 1 and reduce error.	6	3	An	P
3	How do perceptron's function as the building blocks of neural networks, and what are their limitations in solving complex problems? OR What are the key differences between single-layer and multi-layer perceptron's, and how do they impact the learning capabilities of a neural network?	6	2	E	P
4	How does the choice of activation functions and network architecture impact the learning efficiency and generalization ability of an Artificial Neural Network (ANN) in complex real-world applications?	6	4	U	C
5	How does the assumption of linear decision boundaries in logistic regression impact its performance on complex, non-linearly separable datasets, and what strategies can be used to address these limitations?	6	4	An	P
6	How do Long Short-Term Memory (LSTM) networks address the limitations of traditional recurrent neural networks (RNNs) in handling long-term dependencies?	6	4	U	C

No.	Detail of Question	Marks	CO	BL	KL
	OR Explain Stochastic gradient problem in RNN? Justify whether it is solved by LeakyRelu activation function.				

Section – C

*Attempt **All** Questions*   10 X 2 = 20 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Suppose you are working on a project to classify images of handwritten digits (0-9) using a simple neural network. The dataset consists of grayscale images with pixel values ranging from 0 to 255. Each image is 28x28 pixels. You aim to design a basic feedforward neural network for this task. 1. Design a simple feedforward neural network architecture suitable for this digit classification task. Specify the number of input neurons, hidden layers, neurons in each hidden layer, and the output layer. 2. Explain the role of the activation function in neural networks. Discuss why non-linear activation functions are preferred over linear activation functions in most cases. **OR** What are the different types of optimizers used in neural networks, and how do they impact the model's training efficiency and convergence?	10	2	An	P
2	How can neural networks be effectively utilized in the manufacturing industry to enhance production processes and improve overall efficiency? Provide specific examples of neural network applications that could address challenges or optimize various aspects of the manufacturing workflow. **OR** A data science team is developing a neural network model for a customer churn prediction project in a telecommunications company. The team is debating between using the sigmoid and ReLU activation functions for the hidden layers of the neural network. Provide specific examples of how each function's characteristics can impact the model's performance in predicting customer churn.	10	3	An	P