PRESIDENCY UNIVERSITY

BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JAN 2023

Course Code: ECE 322

Course Name: Deep Learning and Applications

Programme: B. Tech (ECE)

Date: 24- 01- 2023

Time: 1.00PM to 4.00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) ***Read Questions carefully and answer accordingly***

(ii) ***Scientific and Non- programmable calculators are permitted***

PART A (Memory Recall Questions)

Answer the following Questions each question carries 6 Marks   [5Q X 6M = 30M]

1. During the training of neural network, the batch size for training and upgrading the weight values plays significant role. Suggest suitable algorithm which reduce the training time and also reduce the processing complexity. Elaborate your suggested algorithm

    (C.O.No.3) [Knowledge]

2. Convolutional Neural Network (CNN) consists of Convolutional Layer with multiple filters and pooling layers. The RELU layer is used to introduce non-linearity in the network architecture. Justify, what is the need of introducing non-linearity in neural network?

    (C.O.No.2) [Knowledge]

3. The transfer learning is very popular technique in the process of neural network based application development. From the designer's point of view, justify the use of transfer learning over development of network from scratch.

    (C.O.No.2) [Knowledge]

4. The concept of Curse of Dimensionality describes the complexities in neural network design. Write note on Curse of Dimensionality.

    (C.O.No.1) [Knowledge]

5. The perceptron is a basic building block in neural networks. The multilayer perceptron can classify input into two or more categories. What are the limitations of single layer perceptron which leads to use of multilayer perceptron? Implement Ex-OR operation using MLP.   (C.O.No.2) [Knowledge]

Answer the following Questions each question carries 10 Marks   [4Q x 10M = 40M]

7. The neural network operations contain two steps namely forward pass and backward pass. For the given neural network, calculate forward propagation and final error in predicted output using the 'RELU' activation function. The required values of weights and bias are as follows.
W1= 0.15, W2=0.25, W3=0.20, W4=0.25, W5=0.35, W6=0.7, W7=0.55, W8=0.35, W9=0.75, W10=0.85, b1=1, b2=1, x4=1, x2=3, x3=5
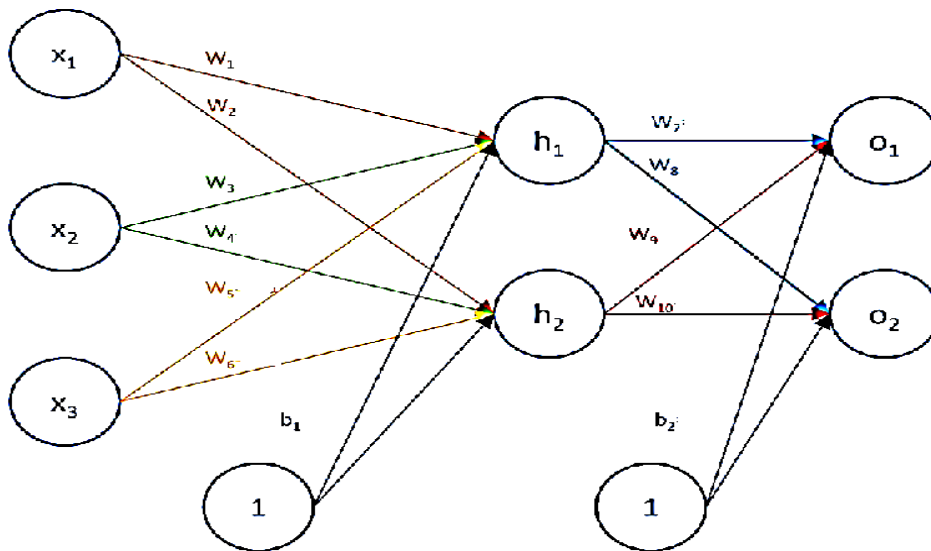
(C.O.No.3) [Comprehension]

8. Mr. Johnson wants to design the neural network for classification of traffic images. He will be using MNIST dataset for training and testing of the network. What parameters Mr. Johnson should refer from dataset during designing of network architecture? Justify how to pre-process the dataset for reduction in training time and CPU resource utilization?

(C.O.No.4) [Comprehension]

9. The single layer perceptron can classify only linear input combinations. As a designer how you will implement Ex-OR classification using perceptron and also mention the issues in use of single layer perceptron in implementation Ex-OR gate operation.

(C.O.No.4) [Comprehension]

10. As the size of neural network increases the error in predicted output also increases. As a designer how will justify this and suggest suitable remedy to reduce output error value in network.   (C.O.No.3) [Comprehension]

PART C (Problem Solving Questions)

**Answer the following Questions each question carries 10 Marks   [3Q x 10M = 30M]**

11. The neural network operations contain two steps namely forward pass and backward pass. For the given neural network, calculate forward propagation and backward propagation (only one pass). The required values of weights and bias are as follows.

W11=0.20, W12=0.37, W12=0.23, W22=0.77, W1= 0.15, W2=0.75, X1=2, X2=3, bias value=0.3, target output= 3.5 for calculation.
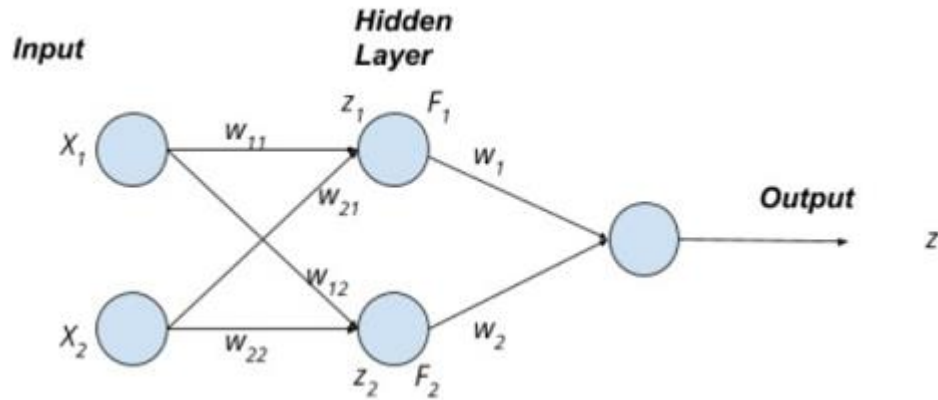
(C.O.No.3) [Application]

12. Dropout is an important remedy to avoid the overfitting in neural networks. Consider the following neural network and apply dropout to 5% neurons in h1 and h2 layer. Calculate the forward propagation for one pass using "Sigmoid" activation.
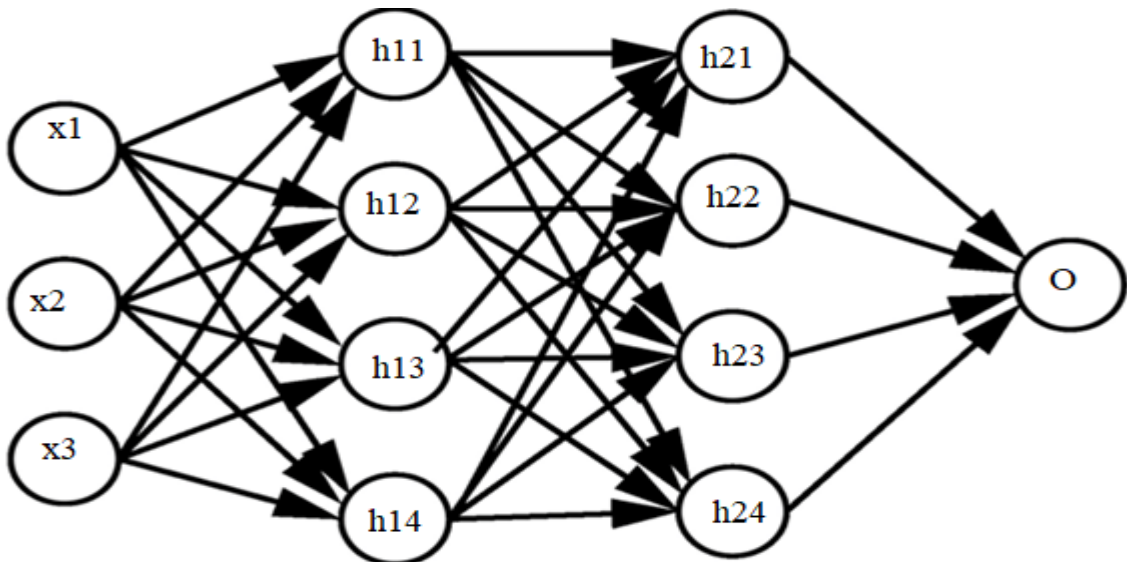
(C.O.No.4) [Application]

13. Mr. William is working on model development for MRI image classification. As a designer elaborate stepwise, how Mr. William will develop CNN model for the required application? What are the various factors Mr. William should consider in the development? Explain the importance of MAX Pooling Layer in this design.

(C.O.No.4) [Application]