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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
MID TERM EXAMINATION - OCT 2023**

**Semester :** Semester V - 2021

**Course Code :** ECE3031

**Course Name :** Sem V - ECE3031 - Applications of Deep Learning

**Program :** B. TECH

**Date :** 30-OCT-2023

**Time :** 11:30AM - 1:00PM

**Max Marks :** 50

**Weightage :** 25%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.
  - (ii) Question paper consists of 3 parts.
  - (iii) Scientific and non-programmable calculator are permitted.
  - (iv) Do not write any information on the question paper other than Roll Number.
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**PART A**

**ANSWER ALL THE QUESTIONS**

**(5 X 2 = 10M)**

1. The single layer perceptron is capable of performing linear classification and regression. What modifications are needed in single layer perceptron architecture to make suitable for non-linear classification applications.  
(CO1) [Knowledge]
2. Confusion matrix is an important tool in analyzing the performance of Convolutional Neural Network (CNN). It provides many view points to analyze the performance of CNN. Explain the significance of F1 score and accuracy in CNN performance analysis.  
(CO2) [Knowledge]
3. 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 the need of introducing non-linearity in neural network?  
(CO1) [Knowledge]
4. The pair of convolution and Pooling layer is used to extract the features in CNN. Explain the role of pooling layer in feature extraction with suitable diagram and also mention types of Pooling layers popularly used in CNN.  
(CO2) [Knowledge]
5. Width and Depth of the neural network are used to specify the size of network. Explain the significance of width in neural network. What is the effect of width variations in neural network output?  
(CO1) [Knowledge]

**PART B**

**ANSWER ALL THE QUESTIONS**

**(2 X 10 = 20M)**

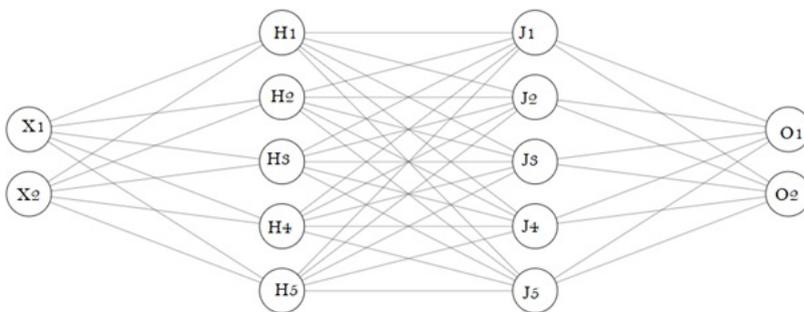
6. a] The performance of CNN can be analyzed using confusion matrix. Comment on the performance of the network represented by the below given confusion matrix. Also suggest necessary solution to improve the performance of the network. [5 Marks]

		Actual Output	
		P (1)	N (0)
Predicted Output	P(1)	75	100
	N(0)	80	53

- b] Increase in number of features or dimensions leads to the complexities in the network implementation and training. As a network designer how will you handle the issues related to the dimensionality in the CNN operations to achieve required performance . [5 Marks]

(CO2) [Comprehension]

7. Neural networks are used in many areas for making predictions based input variables. The output of neural network is also known as prediction. The predictions are made based on bias, weight and input values. Compute the network predictions using given values of input, bias and weight. (Skip activation function from computation)



$W_{11}=0.15$   $W_{12}=0.12$   $W_{13}=0.21$   $W_{14}=0.23$   
 $W_{15}=0.32$   $W_{21}=0.42$   $W_{22}=0.63$   $W_{23}=0.79$   
 $W_{24}=0.13$   $W_{25}=0.34$   
 $WH_{11}=0.23$   $WH_{12}=0.78$   $WH_{13}=0.75$   $WH_{14}=0.12$   
 $WH_{15}=0.45$   $WH_{21}=0.65$   $WH_{22}=0.60$   $WH_{23}=0.15$   
 $WH_{24}=0.32$   $WH_{25}=0.40$   $WH_{31}=0.33$   $WH_{32}=0.37$   
 $WH_{33}=0.50$   $WH_{34}=0.45$   $WH_{41}=0.28$   $WH_{42}=0.47$   
 $WH_{43}=0.21$   $WH_{44}=0.11$   $WH_{45}=0.33$   $WH_{51}=0.12$   
 $WH_{52}=0.32$   $WH_{53}=0.43$   $WH_{54}=0.22$   $WH_{55}=0.25$   
 $WJ_{11}=0.54$   $WJ_{12}=0.55$   $WJ_{21}=0.65$   $WJ_{22}=0.78$   
 $WJ_{31}=0.56$   $WJ_{32}=0.71$   $WJ_{41}=0.31$   $WJ_{42}=0.32$   
 $B_1=1$   $B_2=1$   $B_3=1$   $X_1=0.5$   
 $X_2=1.5$

(CO2) [Comprehension]

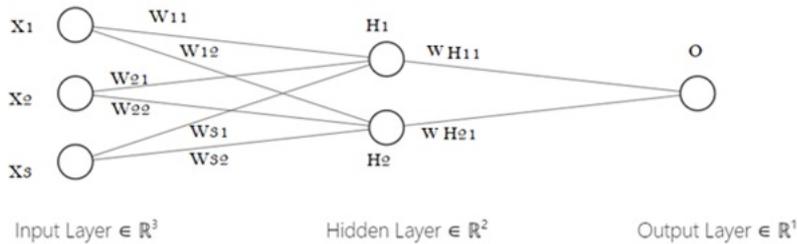
**PART C**

**ANSWER THE FOLLOWING QUESTION**

**(1 X 20 = 20M)**

8. a] 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. (Use your own activation function)

[15 Marks]



$W_{11}=0.80$   $W_{12}=0.90$   $W_{21}=0.10$   $W_{22}=0.21$   
 $W_{31}=0.31$   $W_{32}=0.62$   $W_{H11}=0.22$   $W_{H21}=0.29$   
 $B_1=1$      $B_2=1$      $X_1=1.5$      $X_2=1.0$   
 $X_3=0.5$      $T=1$

- b] Back propagation is an important concept in the Deep Neural Networks (DNN). Considering yourself as a design engineer, explain the importance of back propagation in minimization of loss function (error in output). [5 Marks]

(CO1) [Application]