Total No. of Questions = 05 Total No. of Pages= 04

MKSSS's

Cummins College of Engineering for Women, Pune

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

A.Y. 2022-23, Semester: II

Third Year B. Tech.

In semester Examination (T1), February- 2023

Course Code: 20PEEC601D **Course Name: Deep Learning**

Time: 1:00 Hour **Maximum Marks: 25**

Instructions to candidates:

1. All questions are compulsory.
2. Use of scientific calculator is allowed.
3. Draw diagrams wherever necessary.
4. Assume suitable data wherever necessary.

Q. No.	Questions	Marks	CO	BL
Q.1	(A) McCulloch-Pitts neuron is most widely used the case of ..... functions. (a) binary logic (b) ternary logic (c) quadratic (d) polynomial (B) Recognize from the given equations the type of the neural network model. Equation (1) indicates ..... model and Equation (2) indicates ..... model. $y = 1 \quad if \sum_{i=0}^{n} x_i \geq 0$ $= 0 \quad if \sum_{i=0}^{n} x_i < 0$ **Equation (1)**	(04)	CO1	L1

$$y = 1 \quad if \sum_{i=0}^{n} w_i * x_i \geq 0$$

$$= 0 \quad if \sum_{i=0}^{n} w_i * x_i < 0$$

Equation (2)

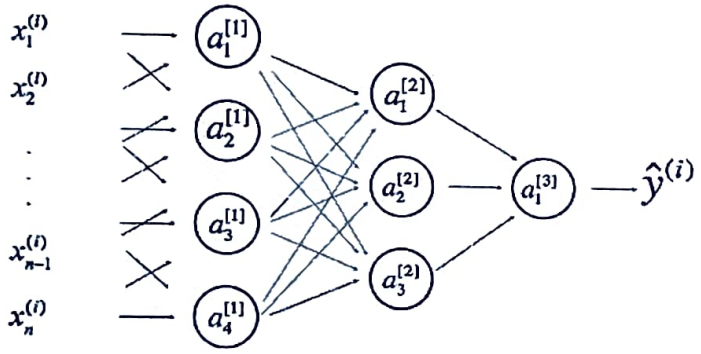
(C) Match the following and find the relationships between biological neural network and artificial neural network.

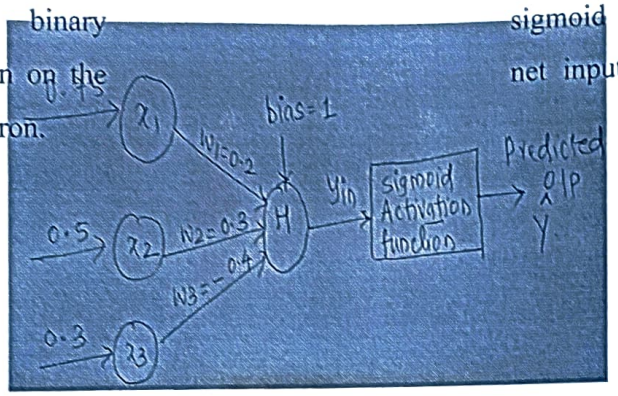
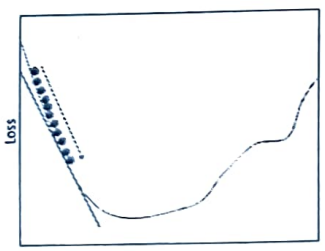
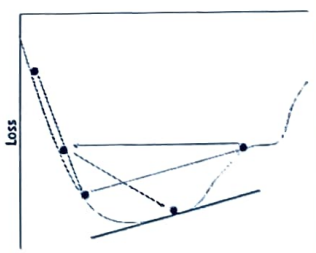
Biological neuron	Artificial neuron
i. Dendrites	a) Net input
ii. Soma	b) Weights or interconnections
iii. Cell	c) Output
iv. Axon	d) Neuron

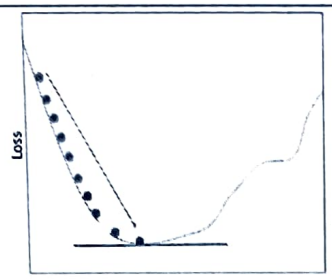
(D) A neural network with multiple hidden layers and sigmoid nodes can form non-linear decision boundaries.

i. True

ii. False

Q.2	(A) Consider the following fully connected neural network with all activations are sigmoid functions. If we initialize all the weights and biases to zero and forward propagate an input x in the network. What is the predicted output, ?  (B) A feedforward network is fed with initial weight, $w_1 = 0.3$ and bias = 1. Actual output of the network is y=0.01 and predicted output is = 0.851432. The derivative of loss function w.r.t. weight w_1 is 0.082167 and the learning rate used is 0.4. Find the updated weight for the w_1 using weight update rule.	(06)	CO1	L2
Q.3		(05)	CO1	L3

	For the network shown in the Figure, calculate the net input to the output neuron. Apply binary sigmoid activation function on the net input and find output of neuron.  			
Q.4	(A) Arrange the steps in correct order for using a gradient descent algorithm. 1. Calculate error between the actual value and the predicted value. 2. Reiterate until there is no weight change. 3. Pass an input through the network and get the network output. 4. Initialize random weight and bias. Also initialize the learning rate. 5. Go to each neuron which contributes to the error and do the parameter adjustments to reduce the error. (a) 1, 2, 3, 4, 5 (b) 4, 3, 1, 5, 2 (c) 5, 4, 3, 2, 1 (d) 3, 2, 1, 5, 4 (B) Identify what is the good learning rate from the given figures. Justify your selection.   	(04)	CO3	L2

				
Q.5	Design a 2-input and single output feedforward network, to be used for a binary classification task. This network has one hidden layer with 2 hidden neurons. Write a Python program/script to implement the design. Assume suitable data and notations for inputs, weights, and output. Show the following steps in your program/script: a) Importing suitable libraries, reading data, and initializing the model parameters. b) Use of suitable activation and loss functions, training rule/algorithm. c) Computation of net input and output at each layer during forward propagation.	(06)	CO6	L4