April – May 2023 (B.Tech) Program: Scheme II Examination: TY Semester: VI Course Code: AIC601 and Course Name: Artificial Neural Network		
Date of Exam:12/05/2023	Duration: 2.5 Hours	Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

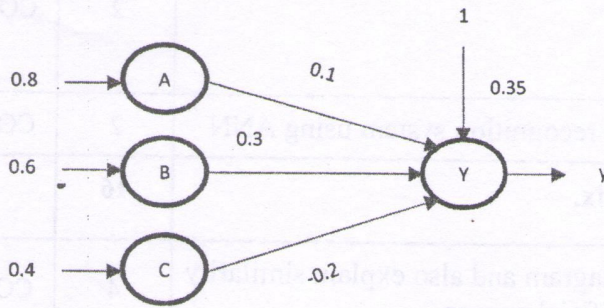|			Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight:**		**12**		
i)	Explain following terminology related to neural network 1. Weight 2. Bias 3. Threshold 4. Learning Rate		2	CO1	U
ii)	Show that the derivative of bipolar sigmoidal function is $f'(x)=(\lambda/2)[1+f(x)][1-f(x)]$.		2	CO2	Ap
iii)	List different learning rules of neural network.		2	CO2	U
iv)	Explain any two applications of Adline network in details		2	CO3	U
v)	Explain Least Mean Square rule developed by Widrow and Hoff for Adline network		2	CO3	U
vi)	Explain operation of Self Organizing Feature Map with diagram.		2	CO4	U
vii)	Find the hamming distance and average hamming distance for the two given input vectors below, X1=[1 1 -1 -1 -1 1 -1 -1 -1 1 -1 -1] X2=[-1 1 1 -1 1 -1 1 -1 1 -1 -1 1]		2	CO5	Ap
viii)	Draw and explain structure of face recognition system using ANN		2	CO6	U
Q.2	**Solve any four questions out of six.**		**16**		
i)	Explain Biological Neuron with diagram and also explain similarity between biological neuron and artificial neuron.		4	CO1	U
ii)	Explain Perceptron Learning rule for single output class with block diagram and write step by step training algorithm.		4	CO2	U

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iii)	Implement ANDNOT function with bipolar inputs and targets using perceptron training algorithm. Learning rate is 1 and threshold is 0. 	4	CO3	Ap

x_1	x_2	t
1	1	-1
1	-1	1
-1	1	-1
-1	-1	-1

iv)	Explain the stages of the SOM algorithm. State applications of Self Organizing Maps.	4	CO4	U
v)	Explain Hebb rule and Outer product rule for training of pattern association nets.	4	CO5	U
vi)	Explain step by step Handwritten Digit recognition in details	4	CO6	U
Q.3	**Solve any two questions out of three.**	**16**		
i)	a) Explain ELU activation function and limitation of ELU function. b) Calculate the output of neuron Y for the net shown below using binary and bipolar sigmoidal activation. 	8	CO1	Ap
ii)	Consider KSO net with two clusters and five input units. The weight vector for the cluster units are given by w1=[1.0 0.9 0.7 0.5	8	CO4	Ap

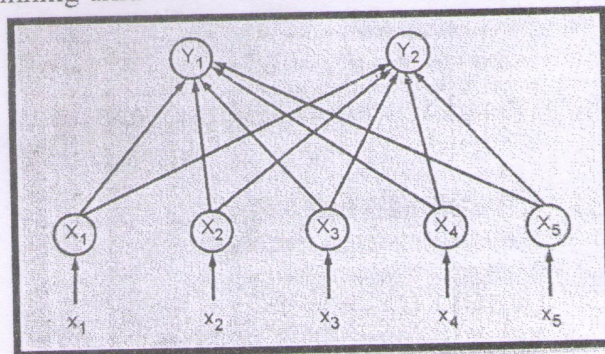|		
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	0.3], w2=[0.3 0.5 0.7 0.9 1.0]. Use the square of the Euclidean distance to find the winning cluster unit for the input pattern x=[0.0 0.5 1.0 0.5 0.0]. Using a learning rate of 0.25, find the new weights for the winning unit. 			
iii)	Train the Hetro-associative memory network using outer product rule to store input row vector s=(s_1, s_2, s_3, s_4) to the output row vector t=(t_1,t_2). The bipolar vector pairs are as given in the table and then test the performance of the network with missing and mistaken data in the test vector.	8	CO5	Ap

	s_1	s_2	s_3	s_4	t_1	t_2
1st	1	−1	−1	−1	−1	1
2nd	1	1	−1	−1	−1	1
3rd	−1	−1	−1	1	1	−1
4th	−1	−1	1	1	1	−1

Q.4	**Solve any two questions out of three.**	**16**		
i)	Using BPN, find the new weights for the net shown. It is presented with the input pattern [-1,1] and the target output is +1. Use a learning rate α=0.25 and bipolar sigmoidal activation function. The initial weights are [v_{11} v_{21} v_{01}]=[0.6 -0.1 0.3], [v_{12} v_{22} v_{02}]=[-0.3 0.4 0.5] and [w_1 w_2 w_0]=[0.4 0.1 -0.2].	8	CO3	Ap

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ii)	Explain step by step Diabetes prediction process using ANN in details	8	CO6	U
iii)	Using the Hebb rule, find the weights required to perform the following classifications of the given input patterns "U" and "L". The pattern is shown as 3x3 matrix form in the squares. The "+" symbols represent the value "1" and the empty squares indicate "-1". Consider "U" belongs to the members of class (so has target value 1) and "L" does not belong to the members of class (so has target value -1).	8	CO2	Ap