

April – May 2024		
B.Tech Program: Artificial Intelligence and Data Science Scheme:II		
Examination: TY Semester: VI		
Course Code: AIC601 and Course Name: Artificial Neural Network		
Date of Exam: 15/05/24	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)	Differentiate between Single-Layer Feed Forward and Multi-Layer Feed Forward neural networks	02	1	U
ii)	Give any eight applications of ANN.	02	1	U
iii)	List different learning rules of ANN	02	2	U
iv)	How to choose right activation functions	02	2	U
v)	Explain any two applications in details of Adaline networks	02	3	U
vi)	Explain the stages of the SOM algorithm	02	4	U
vii)	Explain advantages and disadvantages of associative memory	02	5	U
viii)	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] X2=[-1 1 1 -1 1 -1 1 -1 1 -1 1]	02	5	Ap
Q.2	Solve any four questions out of six.	16		
i)	Explain biological neuron in details and explain similarities between biological and artificial neuron	04	1	U
ii)	Explain RELU and Leaky RELU activation functions	04	2	U
iii)	Explain Madeline network architecture with diagram	04	3	U
iv)	Consider KSO net with two clusters and five input units. The weight vector for the cluster units are given by $w_1=[1.0 \ 0.9 \ 0.7 \ 0.5$	04	4	AP

**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**  
(Autonomous College Affiliated to University of Mumbai)

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	0.3], $w_2=[0.3 \ 0.5 \ 0.7 \ 0.9 \ 0.1]$ . 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.																																						
v)	Train the hetroassociative 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 $t=(t_1, t_2)$ , use vector pair as given in the following table	04	5	Ap																																			
	<table border="1"> <thead> <tr> <th>Input targets</th> <th><math>s_1</math></th> <th><math>s_2</math></th> <th><math>s_3</math></th> <th><math>s_4</math></th> <th><math>t_1</math></th> <th><math>t_2</math></th> </tr> </thead> <tbody> <tr> <td>1<sup>st</sup></td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>2<sup>nd</sup></td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>3<sup>rd</sup></td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>4<sup>th</sup></td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> </tr> </tbody> </table>	Input targets	$s_1$	$s_2$	$s_3$	$s_4$	$t_1$	$t_2$	1 <sup>st</sup>	1	0	1	0	1	0	2 <sup>nd</sup>	1	0	0	1	1	0	3 <sup>rd</sup>	1	1	0	0	0	1	4 <sup>th</sup>	0	0	1	1	0	1			
Input targets	$s_1$	$s_2$	$s_3$	$s_4$	$t_1$	$t_2$																																	
1 <sup>st</sup>	1	0	1	0	1	0																																	
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3 <sup>rd</sup>	1	1	0	0	0	1																																	
4 <sup>th</sup>	0	0	1	1	0	1																																	
vi)	Draw and explain structure of face recognition system using ANN	04	6	U																																			
Q.3	Solve any two questions out of three.	16																																					
i)	Explain following terminology related to neural network in details with examples 1. Weight 2. Bias 3. Threshold 4. Learning Rate	08	1	U																																			
ii)	Show that the derivative of unipolar sigmoidal function is $f'(x)=\lambda f(x)[1-f(x)]$ and derivative of bipolar sigmoidal function is $f'(x)=(\lambda/2)[1+f(x)][1-f(x)]$	08	2	Ap																																			
iii)	Using Madaline Network implement XOR function with bipolar inputs and targets upto 2 <sup>nd</sup> input.	08	3	Ap																																			

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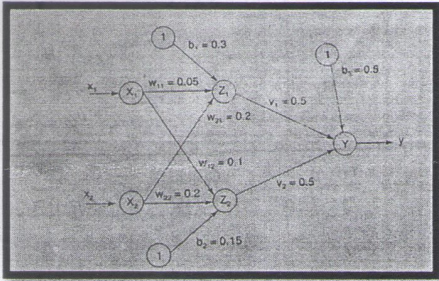
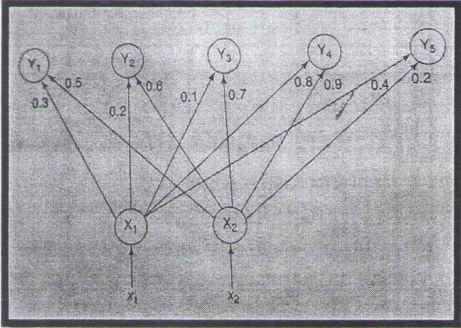
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Q.4	Solve any two questions out of three.	16		
i)	<p>For the given KSOFM with weights as shown use square of Euclidean distance to find the cluster unit <math>Y_j</math>, close to the input vector (0.2, 0.4). Using a learning rate of 0.2 find the new weights for unit <math>Y_j</math>. For the input vector (0.6, 0.6) with learning rate 0.1 find the winning cluster unit and its new weights.</p> 	08	4	Ap
ii)	Train the auto-associative network for the input vector [-1 1 1 1] and also test the network for the same input vector. Test the auto-associative network with one missing, one mistake, two missing and two mistake entries in test vector.	08	5	Ap
iii)	Explain step by step Diabetes prediction process using ANN in details	08	6	U

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