



School of Information Technology and Engineering

Winter Semester 2022-2023 - Fresher

Continuous Assessment Test – I

Programme Name & Branch : MCA

Course Name & code: Soft Computing (ITA6004)

Class Number (s): 0298

Slot: D2+TD2

Faculty Name (s) (Dr. Anitha A)

Exam Duration: 90 Min.

Maximum Marks: 50

1. Differentiate between following: [2x5=10]
 - (i) Hard Computing and Soft Computing
 - (ii) Artificial Neuron and Biological Neuron
2. Implement AND function using McCulloch-Pitts neuron (take binary data). [10]
3. Find the weights using perceptron network for ANDNOT function when all the inputs are presented only one time. Use bipolar inputs and targets. Consider initial weights and bias is set to 0 and learning rate as 1. The truth table for ANDNOT is given below. [10]

X1	X2	Target
1	1	-1
1	-1	1
-1	1	-1
-1	-1	-1

4. Explain the working of Back Propagation Network with the help of suitable diagram. [10]
5. Write short notes on the following: [5x2.5=10]
 - (i) Delta Learning Rule
 - (ii) Accuracy and Precision
 - (iii) Bias
 - (iv) RBF Network



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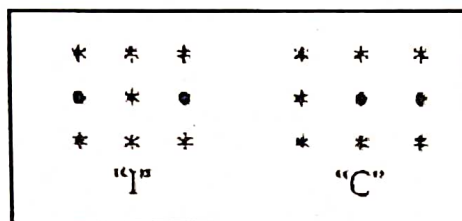
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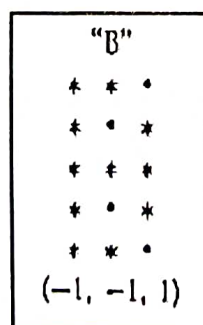
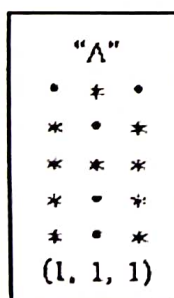
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1. Construct a heteroassociative network for the pattern given below: (15)



The target of I and C are (1,-1) and (-1,1) respectively. Store the pattern and test the network with one missing entries in the test vector.

2. Construct and test BAM network for the given pattern "A" and B" with simple bipolar input-output vectors. The target output for "A" is (1,1,1) and "B" is (-1,-1,1). The display matrix size is 5 x 3 and the input pattern is as shown below. (10)



3. Consider an ART-1 network with four F1 units and three F2 units. After some training the weights are as follows. (15)

Bottom-up weights b_{ij}	Top-down weights t_{ji}
$\begin{bmatrix} 0.57 & 0 & 0.2 \\ 0 & 0 & 0.2 \\ 0 & 0.37 & 0.2 \\ 0 & 0.37 & 0.2 \end{bmatrix}$	$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$

Determine the new weights matrices after the vector (0,0,1,1) is presented if

a. the vigilance parameter is 0.4

b. the vigilance parameter is 0.8

4 a. State the merits and demerits of Kohonen Self organizing maps. (7)

b. How are the initial weights determined for LVQ net? (3)

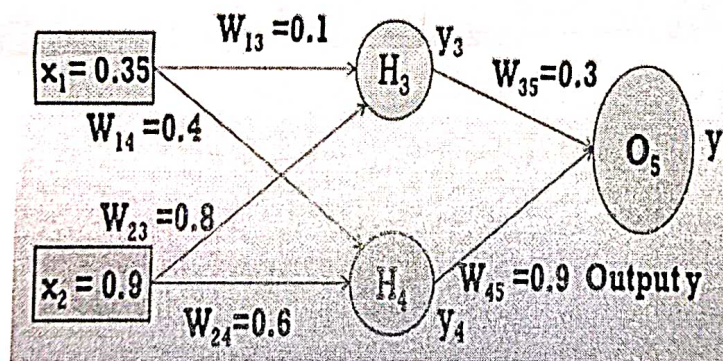
KEEPING MOBILE PHONE/SMART WATCH, EVEN IN "OFF" POSITION IS TREATED AS EXAM MALPRACTICE

Answer ALL Questions

(10 X 10 = 100 Marks)

1. In what kinds of real-time applications soft computing is better choice over the other traditional computing methodologies? Explain in detail.
2. Using linear separability concept, obtain the response for NAND function. (Take bipolar inputs and bipolar targets)
3. Using back propagation neural network, find the new weights for the network shown in the figure below. The network is presented with the input pattern as [0.35, 0.9] and the target output as 0.5. Use learning rate as 1 and the binary sigmoid activation function.

Hint : Binary sigmoid function as $F(x) = \frac{1}{1+e^{-x}}$

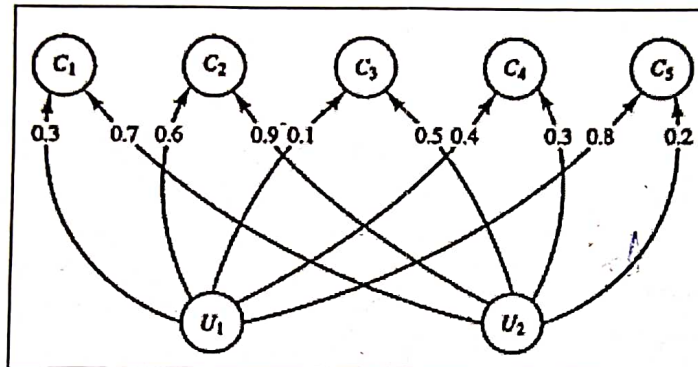


4. Train the heteroassociative memory network using outer product rule to store the input row vectors $s = (s_1, s_2, s_3, s_4)$ to the output vector $t = (t_1, t_2)$ as given in the table below.

Input targets	s1	s2	s3	s4	t1	t2
1 st	1	0	1	0	1	0
2 nd	1	0	0	1	1	0
3 rd	1	1	0	0	0	1
4 th	0	0	1	1	0	1

5. With neat architecture, explain the training algorithm used in ART-1 network.
6. Given a Kohonen self-organizing map with weights as shown in the following diagram.

- (i) Use the square of the Euclidean distance to find the cluster unit C_j that is closest to the Input Vector $(0.5, 0.2)$
- (ii) Using a learning rate of 0.2, find the new weights for unit C_j .
- (iii) If units C_{j-1} and C_{j+1} are also allowed to learn the input pattern, find their new weights.



7. Consider two fuzzy sets

$$A = \left\{ \frac{0.2}{1} + \frac{0.3}{2} + \frac{0.4}{3} + \frac{0.5}{4} \right\}$$

$$B = \left\{ \frac{0.1}{1} + \frac{0.2}{2} + \frac{0.2}{3} + \frac{1}{4} \right\}$$

Find the algebraic sum, algebraic product, bounded sum and bounded difference of the given fuzzy sets.

8. a) Write a comparison between Mamdani and Sugeno Fuzzy Information system. [5]
- b) Discuss various crossover functions/operations in Genetic Algorithm. [5]
9. Explain the concepts of Genetic Fuzzy Systems.
10. Illustrate the home heating system with fuzzy logic control.

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