

SVKM's NMIMS
MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING /
SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Academic Year: 2021-22

Programme: B.Tech (Computer)

Year: III Semester: VI

Subject: Soft Computing

Date: 13 April 2022

Marks: 100

Time: 10.00 am to 1.00 pm

Durations: 3 (hrs)

No. of Pages: 02

Final Examination

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

- 1) Question No. 01 is compulsory.
- 2) Out of remaining questions, attempt any 04 questions.
- 3) **In all 05 questions to be attempted.**
- 4) All questions carry equal marks.
- 5) **Answer to each new question to be started on a fresh page.**
- 6) **Figures in brackets on the right-hand side indicate full marks.**
- 7) **Assume Suitable data if necessary.**

- Q1** Answer briefly: [20]
- CO-02;
SO-01;
BL-04
CO-03;
SO-06;
BL-05
CO-04;
SO-06;
BL-06
- A. List and explain any five learning factors of Error Backpropagation Network.
- B. Explain working principle of MAXNET fixed weight competitive net.
- C. Given two fuzzy sets
- $$A = \left\{ \frac{1}{1.0} + \frac{0.75}{1.5} + \frac{0.3}{2.0} + \frac{0.15}{2.5} + \frac{0}{3.0} \right\}$$
- $$B = \left\{ \frac{1}{1.0} + \frac{0.6}{1.5} + \frac{0.2}{2.0} + \frac{0.1}{2.5} + \frac{0}{3.0} \right\}$$
- Find the following;
1. $A \cup B$ 2. $A \cap B$ 3. $\bar{A} \cup \bar{B}$ 4. $\bar{A} \cap \bar{B}$ 5. $\overline{A \cup B}$
- CO-04;
SO-06;
BL-06
- D. Elaborate on techniques of Encoding in Genetic Algorithm.
- Q2** A. Use outer product rule to store vectors $[-1 \ -1 \ -1 \ 1]$ and $[1 \ 1 \ 1 \ -1]$ in an auto-associative network. [10]
- CO-03;
SO-06;
BL-05
- a. Find the weight matrix.
 - b. Test the network using $[-1 \ -1 \ -1 \ -1]$ as input
 - c. Test the network using $[1 \ 1 \ 1 \ 1]$ as input
 - d. Test the network using $[0 \ 1 \ 1 \ 0]$ as input
 - e. Repeat a-d with diagonal elements of weight matrix set to zero.

Q2
CO-04;
SO-06;
BL-06

- B. Discuss Roulette-Wheel selection technique in Genetic algorithm. [10]

Q3
CO-01;
SO-01;
BL-02
CO-02;
SO-01;
BL-04

- A. Explain different activation functions used in neural networks. [10]

- B. Implement OR function with bipolar inputs and targets using Adaline network. Perform one epoch of training. (Assume initial weights as 0.1 and Learning rate also set to 0.1) [10]

Q4
CO-03;
SO-06;
BL-05

- A. Train a heteroassociative memory network to store the input vectors $s = (s_1, s_2, s_3, s_4)$ to the output vectors $t = (t_1, t_2)$. The vector pairs are given in Table. Also test the performance of the network using its training input as testing input. [10]

	s_1	s_2	s_3	s_4	t_1	t_2
1 st	1	0	0	0	0	1
2 nd	1	1	0	0	0	1
3 rd	0	0	0	1	1	0
4 th	0	0	1	1	1	0

CO-04;
SO-06;
BL-06

- B. List various techniques of defuzzification. Explain any one technique with example. [10]

Q5
CO-02;
SO-01;
BL-04
CO-03;
SO-06;
BL-05

- A. Explain architecture and training algorithm of Perceptron Network for single output class. [10]

- B. Construct a Kohonen self-organizing net with two cluster units and five input units. The weight vectors for cluster are given by [10]

$$w_1 = [1.0 \ 0.9 \ 0.7 \ 0.5 \ 0.3]$$

$$w_2 = [0.3 \ 0.5 \ 0.7 \ 0.9 \ 1.0]$$

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.

Q6
CO-01;
SO-01;
BL-02
CO-04;
SO-06;
BL-06

- A. Explain McCulloch-Pitt's neuron model. Implement AND function using McCulloch-Pitt's neuron: for binary data. [10]

- B. How we combine Genetic algorithm and Neural networks to create hybrid systems? [10]