Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2025

BIOMEDICAL ENGINEERING
Semester – VI

EC 5079 – SOFT COMPUTING AND APPLICATIONS
(Regulation 2019)

Time: 3hrs Max. Marks: 100

CO1	Apply various soft computing frame works
CO2	Apply various Optimization Schemes
CO3	Design of various neural networks
CO4	Applying various fuzzy logic rules
CO5	Discuss hybrid soft computing

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10 x 2 = 20Marks)
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	State the different T-Norm and T-conorm fuzzy operators:	2	CO1	L1
2	Define centroid of area and bisector of area method of Defuzzification:	2	CO1	L1
3	Give two applications of the Simulated Annealing algorithm.	2	CO2	L2
4	State the difference between random search and modified random search method.	2	CO2	L2
5	State the different types of activation functions used in neural networks with required equations:	2	CO3	L1
6	Define the learning rule adopted in ADALINE networks?	2	CO3	L1
7	What is the sequence of steps taken in designing a fuzzy logic system?	2	CO4	L2
8	In an adaptive Fuzzy Inference System, how is the RBFN approximation capability improved?	2	CO4	L2
9	Give the uses of neuro-fuzzy models in color recipe prediction?	2	CO5	L2
10	What is the condition for unreachable work space in inverse kinematics problem?	2	CO5	L1

PART- B (5x 13 = 65 Marks)

Q.No.	Questions	Marks	CO	BL
11 (a)	i. Draw and explain the four fuzzy membership functions of one Dimension:	7	CO1	L3
	ii. Using graphical interpretation, discuss the approximate reasoning for multiple antecedents:	6	CO1	L3
	OR			
11 (b)	Consider two sets of colours; C-1 = {Red, Blue, Green} and C-2 = {Red, Blue, Green, Yellow, Cyan, Magenta}. A function f : C-1 x C-1 → C-2 is defined as shown in the matrix below:	13	CO1	L3

12 (a)	Explain the steepest descent method and classical Newton's method for function minimization. Draw and compare the two methods for different types of contours.	13	CO2	L3
	OR			
12 (b)	With neat illustration, explain the major building blocks of an evolutionary algorithm and also how the next generation is created in this method with appropriate functions.	13	CO2	L3
13 (a)	Develop a Perceptron model for the 'AND' function. Consider binary inputs and bipolar targets without bias up to 2 epochs. Assume learning rate = 1.	13	CO3	L4
	OR			
13 (b)	How are Self Organizing Maps formed? Consider a Kohonen net with two cluster units and three input units. The weight vectors for the cluster units are (0.9, 0.7, 0.5) and (0.4, 0.3, 0.4). Find the winning cluster unit for the input vector (0.3, 0.2, 0.1). Use α = 0.5. Find the new weights for the winning unit.	13	CO3	L4
14 (a)	i. Draw and explain the architecture of a Co-active Neuro-Fuzzy Inference system: ii. Draw and interpret the Neuro-Fuzzy spectrum:	7 6	CO4 CO4	L3 L3
	OR			
14 (b)	Construct an ANFIS Architecture for a First Order Sugeno Fuzzy model using a common rule set with two fuzzy if- then rules as follows: Rule 1 : If x is A_1 and y is B_1, then $f_1 = p_1x+q_1y+r_1$, Rule 2 : If x is A_2 and y is B_2, then $f_2 = p_2x+q_2y+r_1$.	13	CO4	L3
15 (a)	Explain a printed character recognition fuzzy inference system to solve the pattern recognition problem:	13	CO5	L4
	OR			
15 (b)	Explain the process of prediction of automobile fuel efficiency using a simple soft computing method.	13	CO5	L4

	Red	Blue	Green
Red	Red	Magenta	Yellow
Blue	Magenta	Blue	Cyan
Green	Yellow	Cyan	Green

We define two shades of the colours in {red, Blue, Green} as fuzzy sets S -1 and S - 2.
S-1=0.3/red+0.5/blue+0.7/green;
S-2=0.8/red+0.2/blue +0.4/green
Extend the function 'f' to the domain S-1 x S-2 by applying the fuzzy extension principle:

PART- C (1x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16.	i. Explain the algorithm for Multilayer Perceptron Net. Consider an example of your choice and Draw the architecture model, Generate the first training set for the model, Calculate the first stage error. Solve using Back Propagation Algorithm.	(8)	CO4	L5
	ii. Discuss the architecture and characteristics of the network which uses Radial basis functions. Show how it helps to overcome X-OR problem:	(7)	CO4	L5