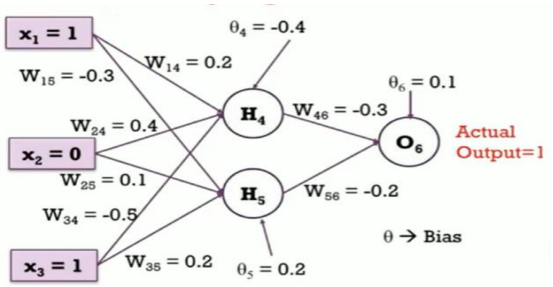
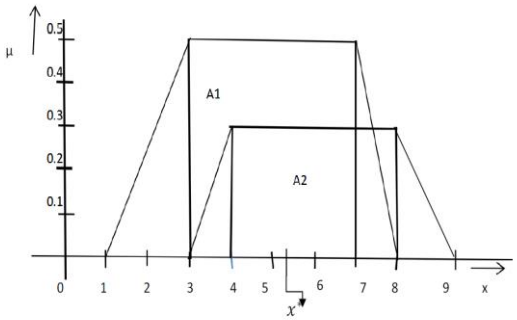
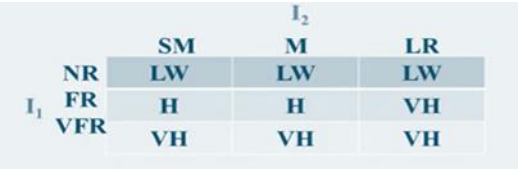
VI Semester BTech Examination May 2024	Set No.: 01
Course name: SOFT COMPUTING PARADIGMS (CSE 4054)	Course code: CSE 4054

Q. No.	Description	Marks	Course Outcome (1-5)	Competency Levels (1-6)	AHEP LO LEVELS
1A	Using the back-propagation algorithm, determine new weights for the following network [perform one iteration]. Target value: 1, learning rate =0.9, Activation function: Sigmoid function. 	5	1	6	2,3
1B	Given a two-input neuron with the following parameters: b = 1.2, W = [3 2] and $x = \begin{bmatrix} -5 & 6 \end{bmatrix}^T$, calculate the neuron output for the following transfer functions: i) A signum transfer function. ii) A hyperbolic tangent transfer function	3	1	5	2,3
1C	Explain unsupervised learning. Discuss one unsupervised learning technique.	2	1	2	2,3
2A	Implement radial basis function neural network for the XOR gate with binary inputs. Increase the dimensionality by considering receptors at the coordinates [0,0], [0,1], [1,0], and [1,1]. The synaptic weight values linking neurons in the hidden layer and the output layer are -1, 1, 1, and -1, respectively.	5	2	5	2,3,6
2B	What are the final weights obtained using the perceptron learning rule for implementing an OR gate with initial weights (w1 = 0.6, w2 = 0.6), threshold (θ = 1), and learning rate (η = 0.5)?	3	1	5	2,3
2C	Using the center of sums method, determine the defuzzified value of the aggregated fuzzy set formed by combining two fuzzy sets C1 and C2, as depicted in Figure 1	2	3	5	2,3

	 Figure 1 : Fuzzy sets C_1 and C_2				
3A	(i) Distinguish between phenotype and genotype. (ii) Consider the following two parents, which will participate in the position-based crossover, and determine the resulting solutions for the two offsprings. Parent 1 A B C D E F G H I * * * * Parent 2 C D E A B I H G F Positions are represented by Asterisk. (iii) Consider the following two parents, who will participate in the position-based crossover (Position-Based Crossover considering 2nd, 4th, and 6th as the crossover points), and determine the resulting solutions for the two offsprings Parent 1: A B C D E F G H Parent 2: C A D B F H E G	**5**	**4**	**5**	**2,3,6,12**
3B	Describe mutation and what are the different types of mutation operations commonly employed in genetic algorithms. Calculate the mutated value Pmutated using the polynomial mutation method, given that Poriginal=15.6, r=0.7, q=2, and Δ=1.2.	**3**	**4**	**5**	**2,3,6,12**
3C	Explain the membership function of a fuzzy set. Can a fuzzy membership be True and False at the same time?	**2**	**3**	**3**	**2,3**
4A	The rule base to be followed for a neuro-fuzzy system is given in the figure below, where I1 and I2 are inputs and O is the output of the controller. The neural network will consist of five layers. The input I1 has been expressed using three linguistic terms: Near (NR), Far (FR), and Very Far	**5**	**5**	**5**	**2,3,6**

	(VFR). Similarly, the input I2 has been expressed using three linguistic terms: Small (SM), Medium(M), and Large (LR). The output has been expressed using three linguistic terms: Low (LW), High(H), and Very High(VH). Draw a neural network that assists to design a fuzzy logic controller for a neuro-fuzzy system and explain the function of each layer.  				
4B	Explain modular neural networks. How do modular neural networks handle complex tasks compared to traditional architectures?	**3**	**5**	**2**	**2,3,6**
4C	Explain the drawback of choosing roulette wheel selection over Rank-based Selection and provide an example to support your explanation.	**2**	**4**	**2**	**2,3,6,12**
5A	Describe ANFIS. Draw the architecture of the ANFIS network and explain it with an example.	**5**	**5**	**5**	**2, 3, 6**
5B	Illustrate the block diagram of the Genetic Neuro-Hybrid Systems and Explain.	**3**	**5**	**2**	**2,3,6**
5C	Describe elitism in genetic algorithms and how it contributes to the optimization process.	**2**	**4**	**2**	**2,3,6,12**

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