BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO/2022)

CLASS: BTECH **SEMESTER : V**
BRANCH: CSE/IT **SESSION : MO/2022**

SUBJECT: CS321-SOFT COMPUTING

TIME: 03 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

Q.1(a)	Suppose that fuzzy set A is described by $\mu_A(x) = bell(x\,;\, a, b, c)$. Show that the classical fuzzy complement of A is describe by $\mu_{\bar{A}} = bell(x; a, -b, c)$ **(CO1)**	[2]	L2
Q.1(b)	In a boiler, pressure and temperature are linguistic parameters. Nominal pressure limit ranges from 300 to 1000 psi. Nominal temperature limit is 80–100◦C. The fuzzy linguistic uses are as follows: "Low" temperature = [1/ 80 + 0.8/ 82 + 0.6/ 84 + 0.3/ 86 + 0.2/ 88 + 0/ 90] "High" pressure = [0/300 + 0.2/500 + 0.3 /600 + 0.5/800 + 0.7/ 900 + 1 /1000] Find the membership functions: for "Temperature not very low", "Pressure is extremely high" and "Pressure is fairly low". **(CO1)**	[3]	L1
Q.1(c)	Explain the following I. Convex and non-convex fuzzy sets II. Normal and subnormal fuzzy sets III. T-norm and T-conorm **(CO1)**	[5]	L2
Q.2(a)	Define the extension principle of fuzzy sets theory. **(CO2)**	[2]	L1
Q.2(b)	Design the FIS for controlling the water level and temperature in the boiler using Sugeno models. Assume your own linguistic variable. **(CO2)**	[3]	L6
Q.2(c)	In the field of computer networking there is an imprecise relationship between the level of use of network communication bandwidth and the latency experienced in peer-to-peer communication. Let X be a fuzzy set of use levels (in terms of percentage of full bandwidth used) and Y be a fuzzy set of latencies (in millisecond) with the following membership function. X = [0.2/10, 0.5/20, 0.8/40, 1/60, 0.6/80, 0.1/100] Y = [0.3/0.5, 0.6/1, 0.9/1.5,1/4, 0.6/8,0.3/20] (a) Find the Cartesian product represented by the Mamdani relation (R) (b) Suppose a second fuzzy set of bandwidth usage given by: X'=[0.3/10, 0.6/20, 0.7/40, 0.9/60,1/80,0.5/100] then find the fuzzy set 'S' using max-min compositional rule. **(CO2)**	[5]	L1
Q.3(a)	In case of small population size, how we can ensure that a large part of the search space is covered? **(CO3)**	[2]	L1
Q.3(b)	Explain genetic operators and fitness function with respect to evolutionary computing. **(CO3)**	[3]	L5
Q.3(c)	Maximize the objective function $f(x) = 2x - x^2/16$ on the interval [0, 31]. The length of the chromosome is fixed as 5-bits and initial population of four chromosomes = {00010, 01001, 10011,11000}.**(CO3)**	[5]	L6
Q.4(a)	What is linear separability? **(CO4)**	[2]	L1
Q.4(b)	Explain the Winner-take-all networks with its architecture and weight updating rule **(CO4)**	[3]	L2
Q.4(c)	Differentiate between supervised and unsupervised training. How does neural network learn during supervised training? Explain with example. **(CO4)**	[5]	L4
Q.5(a)	Discuss the methods of speed-up in the context of ANN training. **(CO5)**	[2]	L6
Q.5(b)	Explain the concept of Adaline with help of neat diagram. **(CO5)**	[3]	L5
Q.5(c)	Derive the weight adaptation rule for backpropagation learning scheme for a feedforward neural network with k-input nodes, h-hidden nodes, and O-output nodes. **(CO5)**	[5]	L4

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