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Eighth Semester B.E. Degree Examination, June/July 2024
Soft and Evolutionary Computing

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the application scope of Neural Networks. **(10 Marks)**

  b. Explain the two major problem solving technologies with a neat diagram. **(10 Marks)**

OR

2 a. Discuss the operations of crisp sets. Consider set X = [2, 4, 6, 8, 10]. Find its power set, cardinality and cardinality of power set. **(10 Marks)**

  b. Given the two fuzzy sets,

$$B_1 = \left\{ \frac{1}{1.0} + \frac{0.75}{1.5} + \frac{0.3}{2.0} + \frac{0.15}{2.5} + \frac{0}{3.0} \right\}$$

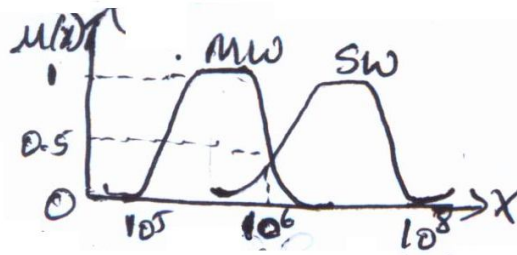$$B_2 = \left\{ \frac{1}{1.0} + \frac{0.6}{1.5} + \frac{0.2}{2.0} + \frac{0.1}{2.5} + \frac{0}{3.0} \right\}$$

Find the following :

(i) $B_1 \cup B_2$ (ii) $B_1 \cap B_2$ (iii) $\overline{B_1}$ (iv) $\overline{B_2}$

(v) $B_1 | B_2$ (vi) $\overline{B_1 \cup B_2}$ (vii) $\overline{B_1 \cap B_2}$ (viii) $B_1 \cap \overline{B_1}$

(ix) $B_1 \cup \overline{B_1}$ (x) $B_2 \cap \overline{B_2}$ (xi) $B_2 \cup \overline{B_2}$ **(10 Marks)**

Module-2

3 a. Define membership function and state its importance in fuzzy logic. Explain the features of membership functions. **(10 Marks)**

  b. Using the inference approach, find the membership values for the triangular shapes I, R, E, IR and T for a triangle with angles $45°$, $55°$ and $80°$.

Membership function for frequency range of receivers
Fig. Q3 (b)   **(10 Marks)**

OR

4 a. List the various methods employed for the membership value assignment. Using your own intuition and definitions of the universe of discourse plot fuzzy membership functions for "Weight of People". **(10 Marks)**

   b. Consider two fuzzy sets A and B, both defined on X, given as follows :

$\mu(x_i X)$	x_1	x_2	x_3	x_4	x_5
A	0.2	0.3	0.4	0.7	0.1
B	0.4	0.5	0.6	0.8	0.9

Express the following A-cut sets using Zadeh's notation :

(i) $\left(\overline{A}\right)_{0.7}$ (ii) $\left(B\right)_{0.2}$ (iii) $\left(A\cup B\right)_{0.6}$ (iv) $\left(A\cap B\right)_{0.5}$

(v) $\left(A\cup \overline{A}\right)_{0.7}$ (vi) $\left(B\cap \overline{B}\right)_{0.3}$ (vii) $\left(\overline{A\cap B}\right)_{0.6}$ (viii) $\left(\overline{A}\cup \overline{B}\right)_{0.8}$

(10 Marks)

Module-3

5 a. What are Genetic algorithms? Explain the terminologies involved in the biological background of species. **(10 Marks)**

   b. Explain Two-point crossover and Precedence Preservative crossover. **(10 Marks)**

OR

6 a. Explain evolution and optimization. How do genetic algorithm differ from traditional algorithms. **(10 Marks)**

   b. Explain the steps of General Genetic Algorithm with a flow chart. **(10 Marks)**

Module-4

7 a. What is Swarm intelligence? List the swarm intelligent systems and explain its concepts. **(10 Marks)**

   b. Explain Serial Ant System Model with Elitist Ants with flow chart. **(10 Marks)**

OR

8 a. Explain the Biological Ant Colony System with neat diagram of how real ants find the shortest path. **(10 Marks)**

   b. Explain the working of an Ant Colony system and Probabilistic Transition Rule. **(10 Marks)**

Module-5

9 a. Describe the various Parameters in PSO. **(10 Marks)**

   b. Explain Artificial Bee colony System with a neat diagram. **(10 Marks)**

OR

10 a. List the steps in working of ABC and explain Cuckoo search algorithm in brief. **(10 Marks)**

    b. What are the characteristic features of PSO? Also compare PSO with other EC Techniques. **(10 Marks)**

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