M. Tech Odd Semester Examination, February, 2023

Computer Science & Engineering

(1st Semester)

Course No.: MCSE-103

(Soft Computing)

Full Marks: 70
Pass Marks: 28

Time: 3 hours

Note:
1. Attempt 05 (Five) questions by taking one form each unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the right margin indicate full marks for the question.

UNIT-I

1. Define some terms: Soft Computing, Hard Computing and Hybrid Computing with some suitable examples. 2+2+2+3+2+3

2. (a) Justify the use of the term: "Soft" in Soft Computing. 2.5

   (b) With the help of an example explain Supervised, Unsupervised, Reinforcement learning. 9

   (c) Difference between Exploration and Exploitation? 2.5

UNIT-II

3. (a) Define the following terms related to Optimization by taking a suitable example: (i) Decision variables (ii) Objective functions (iii)

8. (a) Consider the following two fuzzy sets:

   A= {(.2,1), (.3,2), (.4,3), (.5,4)}
   B= {(.1,1), (.2,2), (.2,3), (1,4)}

   Find the algebraic sum, algebraic product, bounded sum, and bounded difference of the given sets. (9)

   (b) Differentiate the following: (2.5+2.5)

   - Normal and Subnormal Fuzzy Set.
   - Convex and Non-convex Fuzzy Set.

UNIT-V

9. (a) Determine the weights after two steps of training for perceptron learning rule of a Single neural network starting with initial weights: W=[0 0]t , and inputs as

   $X1=[2\ 2]^t$ $X2=[1\ -2]^t$ $X3=[-2\ 2]^t$ $X4=[-1\ 1]^t$
   d1 =0, d2 =1, d3 =0, d4 =1, c=1. 6

   (b) Discuss Global cluster variance in K-Means algorithm. 5

   (c) Discuss different Spatial distance functions. 3

10. (a) Discuss different aspects of Machine Learning algorithms. 5

    (b) How a derivative based optimization is different from a derivative free algorithm? 4

    (c) Discuss different Fuzzy Hedges. 5

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Functional constraints (iv) geometric constraints 4x2=8

(b) Explain the Principle of Optimization with a suitable example. 3+3

4. (a) Why do the solutions of a steepest descent mehod get stuck at the local minima? 3

(b) Minimize f(x1, x2) == $2x_1^2 + x_2^2 - x_1x_2 + 5x_1 + x_2$ in the range of -100 =x_1, x_2<=100, using gradient descent algorithm.

Take the initial solution X1 = $\{0, 0\}^T$. 6

(c) Discuss the drawbacks of traditional optimization algorithms. 5

UNIT-III

5. (a) Why do we prefer a ranking selection to Roulette - Wheel selection in GA? 3

(b) Can you declare GA a global optimizer? 3

(c) Crossover or Mutation? Which one of the two is more powerful? 3

(d) What are the limitations of Binary-coded GA? 2

(e) How will you set the parameters of GA? 3

6. (a) How can you combine local and global optimum search algorithms? 3

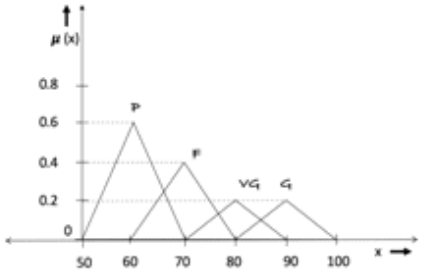
(b) When and why do we prefer a real-coded GA to a binary-coded GA? 3

(c) Discuss edge recombination as a Crossover method in scheduling GA? 4

(d) To solve an optimization problem using real coded GA, let us assume that a mating pair is found to be as follows:
Pr1=16.85, Pr2 = 19.50
Determine the children solutions using linear crossover technique. 4

UNIT-IV

7. (a) Let A be a fuzzy set that tells about a student as shown in figure below. Here, the linguistic variable P represents a Pass student, F stands for a Fair student, G represents a Good student and VG represents a Very Good student. Calculate the defuzzified value for the fuzzy set A with weighted average method and center of sums. 5



0.3 0.4
0.1 0.1

(b) Two fuzzy relations A and B are given below:

$A = [a_{ij}] =$

$$B=[b_{jk}] = \begin{matrix} 0.2 & 0.6 & 0.7 \\ 0.9 & 0.8 & 0.1 \end{matrix}$$

Determine the composition of these two fuzzy relations. (6)

(c) Determine Cartesian product of the following two fuzzy sets:

A(x)= {(x1,0.1), (x2, 0.25), (x3, 0.34)}
B(y)= {(y1, 0.8), (y2,0.7)} (3)