Indian Institute of Engineering Science & Technology, Shibpur
Department of Computer Science & Technology

M.Tech 1st Semester Examination, 2023

Subject: Soft Computing (Open Elective)

Code: CS5161 Full Marks- 30 Time: 2hrs

Answer any two questions

1. (a) Assume universe of discourse of Temperature U ={-10°C, -5°C, ... 40°C}

Fuzzy sets: "very cold", "cold" and "not cold" are defined below by the respective equations.

$$\mu_C(x) =$$

$$\frac{(x-(-10)}{(0-(-10)} \text{ if } -10^0 < x <= 0^0 \text{ (C=very cold)}$$

$$= 1, \text{ if } \quad 0^0 < x <= 15^0 \text{ (C=cold)}$$

$$= 0, \text{ if } x > 15^0 \text{ (C=not cold)}\}$$

Fuzzy set: "not warm", "moderately warm", "warm"

$$\mu_D(x) = \{0, \text{ if } x <= 25^0 \text{ (D=not warm)}$$

$$= \frac{x-25}{35-25} \text{ if } 25^0 < x <= 35^0 \text{ (D=moderately warm)}$$

$$= 1, \text{ if } 35^0 < x <= 40^0 \text{ (D=warm)}\}$$

Perform the following operations to obtain the result:

(i) Fuzzy Relational Matrix R(x) considering fuzzy sets C(x) and D(x).
(ii) Max-Min Composition – F (x) = C(x) ∘ R(x) or D(x) ∘ R(x)
(iii) Draw the membership curve of F(x) 5×3

2. (a) What are the implications of using Generalized Modus Ponen and Genaralized Modus Tollen in Approximate Reasoning?
(b) What are the salient characteristics of Radial Basis Function Neural Network?
(c) Why do we use Linguistic hedge operator? 6+6+3

3. (a) What are the properties of Fuzzy C-means clustering algorithm? (Do not write the algorithm)
(b) What do we use Activation functions in neural network architecture?
(c) What do you mean by linearly separable problem? 3+5+7

4. (a) What do you mean by feedforward neural network?
(b) Why fuzzificationa and defuzzification is used in developing Fuzzy Inference Systems?
(c) Why Defuzzification is not required for Sugeno method? 6+6+3