JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -1 EXAMINATION- 2024
M.Tech-II Semester (ECE/CSE)

COURSE CODE(CREDITS): 22M11CI211(3) MAX. MARKS: 15
COURSE NAME: SOFT COMPUTING
COURSE INSTRUCTORS: MUNISH SOOD MAX. TIME: 1 Hour

Note: (a)All questions are compulsory.
(b)Marks are indicated against each question in square brackets.
(c) The candidate is required to make suitable numeric assumptions wherever required for solving problems

Q1) Suppose we have a simple fuzzy inference system to control the speed of a fan based on the temperature in a room. The input temperature is crisp and ranges from 0 to 100 degrees Fahrenheit. The output fan speed is also crisp and ranges from 0 to 10. The system has three fuzzy sets for the temperature input: "Cold", "Warm", and "Hot". The following rules govern the system:

1. IF temperature is Cold THEN fan speed $y = 0.03x+2$
2. IF temperature is Warm THEN fan speed $y = 0.05x$
3. IF temperature is Hot THEN fan speed $y = 0.04x+1$

Suppose the input temperature is 65 degrees Fahrenheit. What should the output fan speed be according to the Sugeno fuzzy inference system? Use triangular membership function. **[5]CO-2**

Q2) Compare two sensors based on their detection level and Gain settings. **[3]CO-1**

Gain Setting	Detection level of Sensor 1	Detection level of sensor 2
0	0	0
10	0.2	0.45
20	0. 35	0.25
30	0.65	0.70
40	0.75	0.95
50	0.1	0.1

Q3) Q2) Consider two fuzzy sets **CO-1[4]**

$$A_{\sim=}\left\{\frac{1}{3.0}+\frac{0.65}{5.0}+\frac{0.5}{7.0}+\frac{0.35}{9.0}+\frac{0}{11.0}\right\}$$

$$B_{\sim=}\left\{\frac{0}{3.0}+\frac{0.35}{5.0}+\frac{0.5}{7.0}+\frac{0.65}{9.0}+\frac{1}{11.0}\right\}$$

Calculate (i) $\overline{A_{\sim} \cup B_{\sim}}$

(ii) $A\sim \cap \overline{A_{\sim}}$

Q4) Given a fuzzy relations $\tilde{R} = \begin{bmatrix} 0.3 & 0.4 \\ 0.5 & 0.2 \end{bmatrix}$ between two fuzzy sets $\tilde{X}$ *and* $\tilde{Y}$. Similarly

$\tilde{S} = \begin{bmatrix} 1 & 0.2 & 0.4 \\ 0.8 & 0.3 & 0.7 \end{bmatrix}$ between two fuzzy sets $\tilde{Y}$ *and* $\tilde{Z}$. Obtain fuzzy relation T as a composition between fuzzy relations using Max-Product composition. **[3] CO-1**