VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Even Mid Semester Examination for Academic Session 2024-25

COURSE NAME: B. Tech SEMESTER: 3rd

BRANCH NAME: EE (A and B), and EEE
Optimization & Soft Computing

FULLMARKS:30 TIME:90 Minutes

Answer All Questions.
The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions. **[2 × 3]**

a) Define optimization problem. What is duality principle? -CO1
b) What do you mean by soft computing? How is it different from Hard computing? -CO2
c) Distinguish between fuzzy set and crisp set. -CO3

Q2. **[8]**

a) Consider the well-known graph k-colouring problem. Here we are given a set of points (vertices) and a list of connections between them (edges). The task is to assign one of k colours to each vertex, so that no two vertices which are connected by an edge share the same colour. -CO1

i) Formalise this problem as a free optimisation problem.
ii) Formalise this problem as a constraint satisfaction problem.
iii) Formalise this problem as a constrained optimisation problem.

OR

b) How are objective functions classified in the context of optimization? Explain using suitable examples. -CO1

Q3. **[8]**

a) Explain the trapezoidal membership function with the help of mathematical expression and relevant graph. -CO2
b) Consider the following two fuzzy sets A and B defined over a universe of discourse [0, 3] of real numbers with their membership functions, $\mu_A(x) = \frac{x+5}{x+8}$ and $\mu_B(x) = 2^{-x}$. Determine the membership functions of the following:

i) $A^c \cdot B^c$
ii) $A \cup B$
iii) $A \cap B$
iv) $(A \cup B)^c$

OR

a) Consider $X = \{a, b, c, d\}$, and $Y = \{1, 2, 3, 4\}$ be the universe of discourses. Let, A = $\{(a, 0.0), (b, 0.8), (c, 0.6), (d, 1)\}$, B = $\{(1, 0.2), (2, 1), (3, 0.8), (4, 0.2)\}$ and C = $\{(1, 0), (2, 0.6), (3, 0.8), (4, 0.6)\}$ are three fuzzy sets. Determine the implication relation "*If x is A Then y is B Else y is C*". -CO2

b) Describe all the properties of Fuzzy sets.