

**M.Sc. 4th Semester Examination, 2024**

**APPLIED MATHEMATICS**

*( Lab : Soft computing techniques using MATLAB )*

( Practical )

PAPER — MTM-499 (New)

*Full Marks : 25*

*Time : 2 hours*

*The questions are of equal value*

Answer **one** question which is selected by **lottery**

1. Implement the selection operator of Binary coded GA in MATLAB for the optimization problem  $Max f(x, y) = y \sin x - x \sin y$ ,  $-5 \leq x, y \leq 5$ .

2. Implement the cross-over operator of Binary coded GA in MATLAB for the optimization problem  $Max f(x, y) = \sin x + \sin y$ ,  $0 \leq x, y \leq 10$ .
3. Implement the mutation operator of Binary coded GA in MATLAB for the optimization problem  $Max f(x, y) = xe^{-x^2 - y^2}$ ,  $-3 \leq x, y \leq 3$ .
4. Implement the selection operator of Real coded GA in MATLAB for the optimization problem  $Max f(x, y) = y \sin x - x \sin y$ ,  $-5 \leq x, y \leq 5$ .
5. Implement the cross-over operator of Real coded GA in MATLAB for the optimization problem  $Max f(x, y) = \sin x + \sin y$ ,  $0 \leq x, y \leq 10$ .

6. Implement the mutation operator of Real coded GA in MATLAB for the optimization problem  $Max f(x,y) = xe^{-x^2 - y^2}$ ,  $-3 \leq x, y \leq 3$ .
7. Write a MATLAB program to generate the output of logic AND function by McCulloch-Pitts Neuron Model with threshold value 2.
8. Write a MATLAB program to generate the output of logic XOR function by McCulloch-Pitts Neuron Model with threshold value 1.
9. Write a MATLAB program to generate the output of logic ANDNOT function by McCulloch-Pitts Neuron Model.
10. Write a MATLAB program to find the weights required to perform the following classifications using Hebbian Learning Rule. Vectors  $(1,1,1,1)$  and  $(-1,1,-1,-1)$  are members of class with target value 1; Vectors  $(1,1,1,-1)$  and  $(1,-1,-1,1)$  are members of class with target value  $-1$ .

11. Write a MATLAB program to train logic XOR function with bipolar inputs and targets using Hebbian Learning Rule.
12. Write a MATLAB program to train logic AND function with binary inputs and bipolar targets using Perceptron Learning Algorithm.
13. Write a MATLAB program to find intersection, union, and complement of two given fuzzy relations.
14. Write a MATLAB program to find the max-min composition of two fuzzy relations.

**[Notebook & Viva: 05]**

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