Read the following instructions carefully before attempting the question paper.

1. This question paper is divided into two parts A and B.
2. Part A contains 10 questions of 2 marks each. All questions are compulsory.
3. Part B contains 6 questions of 10 marks each. Attempt any 5 questions out of these 6 questions. In case all the 6 questions are attempted then only the first five attempted questions will be evaluated.
4. Answer all questions in serial order.
5. Do not write or mark anything on the question paper except your registration no. on the designated space.

Time Allo

Q1.

Part-A

(a)Consider the universal set denoted by U as given: where U= {1,2,3,4,5} and S={1,2}. Examine the set in which S contains inside U with the help of a boolean.

(b)Explain the Mamdani method of a fuzzy set.

(c)Consider A and B are two fuzzy sets where A={(2,1),(3,0.5)} and B={(3,1),(4,0.5)}. Find A+B

(d)What is Search Space in Genetic Algorithms?

(e)**Comparison of Natural and Genetic Algorithms Terminology?**

(f)What is Mutation in Genetic Algorithms?

(g)Deduce metaheuristic search optimization algorithm? List four algorithms.

(h)Explore the usefullness of Pheromone for searching route in Ant Colony Optimization algorithm?

(i)Survey the important parameters used in Bat Optimization Technique?

(j)Deduce the alpha, beta and gama terms are used in wolf optimization technique.

CO4, L3, [2 marks]
CO4, L3, [2 marks]
CO4, L3, [2 marks]
CO5, L4, [2 marks]
CO3, L3, [2 marks]
CO4, L3, [2 marks]
CO5, L4, [2 marks]
CO5, L4, [2 marks]
CO5, L4, [2 marks]
CO5, L4, [2 marks]

Part-B

Q2) Find the eigenvalue and eigenvector of a Matrix Where A=

$$\begin{matrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{matrix}$$

Prove the sum of eigenvalues of a Matrix A is equal to the trace of A Matrix.

Q3) What is Corelation matrix? Write the Python code for Corelation matrix.

Q4) Explain the steps of Principle Component Analysis.

CO1, L1, [10 marks]
CO2, L2, [10 marks]
CO2, L2, [10 marks]

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Q5) Find the defuzzification value using Center of gravity (COG) / Centroid of Area (COA) Method.
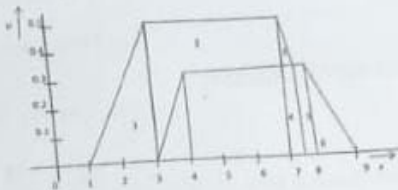
CO3, L3, [10 marks]

Q6)
Suppose a genetic algorithm uses chromosomes of the form x = abcdef with a fixed length of six genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: $f(x) = (a + b) - (c + d) + (e + f)$ and let the initial population consist of four individuals with the following chromosomes: $x1 = 011010$ $x2 = 011001$ $x3 = 011000$ $x4 = 011011$
a.) Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.
b.) Identify two best chromosome by applying the mutation operation.

CO5, L3, [10 marks]

Q7) Illustrate the importance of Local best and Global best solutions with respect to Particle Swarm Optimization in details.

CO5, L4, [10 marks]

--End of Question paper--