Total No. of Printed Pages: 2

PRN No.		PAPER CODE	U325-244A (ESE)

May 2025 (END SEM) EXAM

TY (SEMESTER - II)

COURSE NAME: SOFT COMPUTING AND OPTIMIZATION TECHNIQUES **Branch: CSE (AI)** **COURSE CODE: CAUA32204A**

(PATTERN 2020R1)

Time: [1 HR 30 Min] **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any two sub questions each from each Question 1 ,2, 3 and 4 respectively**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) A health monitoring app aims to predict potential heart risks based on user data such as age, lifestyle, and medical history. Discuss how neural networks can be trained for this prediction task. What learning method would you apply and why?	[5]	CO1	Apply
	b) Soft computing techniques are known for handling uncertainty and imprecision. Justify this statement with examples from different domains where traditional methods fail.	[5]	CO 2	Apply
	c) Explain the concept of "computational intelligence". How do neural networks, fuzzy logic, and evolutionary algorithms contribute to building intelligent systems?	[5]	CO 2	Apply
Q2	a) Compare and contrast fuzzy sets with crisp sets through a real-world example like a medical diagnosis system. How does the use of fuzzy sets improve the system's reliability?	[5]	CO3	Apply
	b) An electric kettle is designed to maintain the water temperature between 85°C and 95°C for brewing tea. Design a fuzzy controller that adjusts the heating element power based on current temperature and lid	[5]	CO3	Apply

	status (open/closed). Define suitable membership functions, write fuzzy rules, and explain how the output is determined. c) A traffic signal controller adjusts signal time based on traffic density and waiting time. Develop a fuzzy controller design including input/output variables, rule base, and defuzzification method. Discuss how this controller improves traffic flow.	[5]	CO3	Apply
Q3.	a) A cloud service provider wants to minimize the cost of server allocation based on fluctuating demand. Formulate this as a linear programming problem, defining decision variables, constraints, and objective function.	[5]	CO4	Apply
	b) A manufacturing company produces two products using two machines. Formulate a linear programming problem to maximize profit, given machine availability and product requirements. Clearly identify decision variables, constraints, and objective function.	[5]	CO4	Apply
	c) A data center operates under thermal constraints. Construct a constrained optimization problem to minimize power usage while ensuring temperature does not exceed a threshold.	[5]	CO4	Apply
Q.4	a) Consider a binary PSO algorithm being used for feature selection in a machine learning task. Illustrate how particles and velocities are represented and updated in binary space.	[5]	CO5	Apply
	b) Use a simple Genetic Algorithm to maximize the function $f(x)=x^2$ for $x \in [0,31]$ represented using 5-bit binary strings. Show initial population, fitness calculation, crossover, and mutation steps for one generation.	[5]	CO5	Apply
	c) Compare and contrast the roles of crossover and mutation in Genetic Algorithms. Use an example to analyze how both contribute to exploration and exploitation of the search space.	[5]	CO5	Apply

**********BEST OF LUCK**********