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PAPER CODE	U325-254ACE
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**(AY:2024-25) May 2025 (ENDSEM) EXAM
TY (SEMESTER - II)**

COURSE NAME: SOFT COMPUTING AND OPTIMIZATION ALGORITHMS **Branch: CSE -AIML** **COURSE CODE: CMUA32204A**
(T.Y PATTERN 2020R1)

Time: [1Hr 30 Min]

[Max. Marks: 40]

(*) Instructions to candidates:

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

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) A self-driving car needs to make decisions based on uncertain sensor inputs (e.g., fog, poor lighting). Discuss how soft computing techniques can be applied to improve decision-making in such uncertain environments. Which technique(s) would you choose and why?	[5]	CO 1	Apply
	b) Design a fuzzy logic controller for a simple temperature control system. Clearly define input/output variables, membership functions, and rule base.	[5]	CO 2	Apply
	c) Discuss the learning paradigms used in neural networks: supervised, unsupervised, and reinforcement learning. Give an example for each.	[5]	CO 2	Apply
Q2	a) A washing machine uses fuzzy logic to determine washing time based on the dirtiness of clothes and load size. Design a fuzzy inference system for this case, including fuzzification, rule base, inference, and defuzzification.	[5]	CO3	Apply
	b) A car climate control system adjusts the fan speed based on temperature and humidity. Define suitable membership functions for these input variables and explain how fuzzy rules would be framed to control the fan speed.	[5]	CO3	Apply
	c) A company wants to rank suppliers based on multiple criteria like delivery time, cost, and quality, which are often vague. Formulate a fuzzy relation matrix for this multi-criteria	[5]	CO3	Apply

	decision-making task and explain how to interpret the result.			
Q3	a) A function $f(x, y) = x^2 + y^2 + xy - 4x - 6y$ is to be minimized. Use optimality conditions to find the local minimum. Is the point obtained a global minimum?	[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
Q4	a) Write the pseudo-code for the basic Particle Swarm Optimization algorithm and explain how personal best and global best values are updated during iterations.	[5]	CO5	Apply
	b) Create a hybrid optimization approach combining PSO and GA for solving a real-world problem like power grid load balancing. Describe how components of both algorithms would be integrated.	[5]	CO5	Apply
	c) Evaluate the suitability of using Genetic Algorithms vs. PSO for solving high-dimensional search problems like hyperparameter tuning in neural networks. Discuss with examples.	[5]	CO5	Apply

*****Best of Luck*****