Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

PG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: M.Sc., INFORMATION TECHNOLOGY

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	CORE - 4	P23IT304	SOFT COMPUTING

Date & Session:23.04.2025/FN **Time : 3 Hours** **Maximum 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	Soft computing differs from hard computing in its ability to handle: a) Precise data b) Uncertainty and approximation c) High-speed calculations d) Binary logic
CO1	K2	2.	The McCulloch-Pitts neuron model uses: a) Continuous activation b) Threshold logic c) Fuzzy sets d) Genetic operators
CO2	K1	3.	Backpropagation is a learning algorithm used in: a) Multilayer perceptrons b) Kohonen networks c) Hopfield networks d) ART networks
CO2	K2	4.	In a Radial Basis Function Network, the activation function is typically: a) Sigmoid b) Gaussian c) Step function d) Linear
CO3	K1	5.	A fuzzy set allows membership values in the range: a) {0, 1} b) [0, 1] c) {-1, 1} d) [0, ∞)
CO3	K2	6.	The defuzzification method that selects the output with the highest membership value is: a) Centroid b) Maximum c) Weighted average d) Bisector
CO4	K1	7.	The extension principle in fuzzy logic is used to: a) Extend crisp functions to fuzzy sets b) Define membership functions c) Optimize genetic algorithms d) Train neural networks
CO4	K2	8.	In fuzzy decision-making, aggregation of rules refers to: a) Combining antecedents b) Combining consequents c) Fuzzifying inputs d) Defuzzifying outputs
CO5	K1	9.	Crossover in genetic algorithms is used to: a) Combine parent solutions b) Mutate genes c) Select the fittest individuals d) Initialize the population
CO5	K2	10.	The schema theorem in genetic algorithms explains: a) Mutation rates b) Survival of high-fitness schemata c) Population diversity d) Encoding methods
Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – B (5 X 5 = 25 Marks) Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Compare soft computing and hard computing in terms of tolerance for imprecision, adaptability, and application domains. **(OR)**

CO1	K3	11b.	Explain the learning process in artificial neural networks with a focus on weight adjustment and error minimization.
CO2	K3	12a.	Design a perceptron to implement the AND logic gate. Include the activation function and weight updates.. **(OR)**
CO2	K3	12b.	Describe the working of a Hopfield network and its application in associative memory.
CO3	K4	13a.	Perform the union and intersection operations on two fuzzy sets (A = { (x_1, 0.3), (x_2, 0.7) }) and (B = { (x_1, 0.5), (x_2, 0.4) }). **(OR)**
CO3	K4	13b.	Explain the centroid method of defuzzification with a numerical example.
CO4	K4	14a.	Apply the extension principle to compute the fuzzy output (C = A + B), where (A = { (1, 0.2), (2, 0.5) }) and (B = { (3, 0.4), (4, 0.6) }). **(OR)**
CO4	K4	14b.	Discuss the role of fuzzy inference systems in decision-making with an example.
CO5	K3	15a.	Implement a simple Genetic Algorithm to maximize the function $f(x)=x^2$ for $x \in [0,15]$. Include encoding, selection, and crossover steps. **(OR)**
CO5	K3	15b.	Analyze the schema theorem and its implications for the survival of high-fitness schemata in genetic algorithms.

Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Design a Hebbian learning-based neural network for pattern recognition and simulate its training process for a sample dataset. **(OR)**
CO1	K3	16b.	Critically evaluate the limitations of McCulloch-Pitts neurons in modeling real-world problems and suggest improvements.
CO2	K4	17a.	Develop a backpropagation neural network to solve the XOR problem. Include architecture, activation functions, and training steps. **(OR)**
CO2	K4	17b.	Compare supervised vs. unsupervised learning in neural networks, focusing on applications like classification and clustering.
CO3	K4	18a.	Design a fuzzy logic controller for an air-conditioning system that adjusts temperature based on humidity and occupancy. Define membership functions and rules. **(OR)**
CO3	K4	18b.	Prove that fuzzy relations are closed under max-min composition and demonstrate with an example.
CO4	K5	19a.	Optimize a fuzzy decision-making system for traffic light control under varying traffic densities. Use fuzzy arithmetic and defuzzification. **(OR)**
CO4	K5	19b.	Investigate the stability of fuzzy logic controllers and discuss methods to avoid oscillations in output.
CO5	K5	20a.	Propose a genetic algorithm to solve the Traveling Salesman Problem (TSP). Define encoding, fitness function, and genetic operators. **(OR)**
CO5	K5	20b.	Analyze the role of mutation in maintaining genetic diversity and preventing premature convergence in genetic algorithms.