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Code No. : 18332 N

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**B.E. (E.E.E.) VIII-Semester Main Examinations, May-2023**

**AI Applications to Power Systems (PE-VI)**

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Explain the Importance of learning rate, momentum factor in ANN?	2	2	1	1,2,3,12
2.	Examine the need of an activation function in the neural networks?	2	4	1	1,2,3,12
3.	Draw the block diagram of fuzzy logic system and list various modules in it?	2	1	2	1,2,3,12
4.	Define defuzzification and list out different types of defuzzification methods in fuzzy logic?	2	1	2	1,2,3,12
5.	Explain Elitism in Genetic Algorithm?	2	2	3	1,2,3,12
6.	Illustrate the reason for the lower value of mutation probability in Genetic Algorithm?	2	4	3	1,2,3,12
7.	Differentiate the local best and global best in Particle swarm optimization?	2	4	4	1,2,3,12
8.	Mention the various algorithm specific parameters in Particle swarm optimization and define their ranges?	2	2	4	1,2,3,12
9.	Among PSO, ANN and Fuzzy Logic, which one is more suitable to load forecasting problem and justify it?	2	4	5	1,2,3,12
10.	Mention the applications of PSO, GA in real time power system problems?	2	1	5	1,2,3,12
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Explain in detail the training algorithm for Back Propagation method in Neural networks using necessary equations?	6	2	1	1,2,3,12
b)	Draw the structure of biological neuron and mention various components in it?	2	1	1	1,2,3,12
12. a)	Explain any four types of membership function used in Fuzzy Logic System with suitable sketch and mathematical equation.	4	2	2	1,2,3,12
b)	Two fuzzy sets are given as: $A = \{(x_1, 0.1), (x_2, 0.2), (x_3, 0.3), (x_4, 0.4)\}$ and $B = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0.8), (x_4, 0.9)\}$ Compute following:	4	4	2	1,2,3,12
	a) Algebraic Product of A and B				
	b) Union of A and B				
	c) Multiplication of fuzzy set A by crisp number 0.2				
	d) Algebraic sum of A and B				
13. a)	Illustrate any four cross-over techniques with the help of suitable examples?	4	3	3	1,2,3,12
b)	Illustrate the significance of mutation in Genetic algorithm and explain how mutation can be implemented with the help of suitable example?	4	3	3	1,2,3,12
14. a)	Explain step-by-step implementation of Particle Swarm optimization algorithm with suitable equations.	4	2	4	1,2,3,12

b) Apply Jaya algorithm for calculating maximum value of the optimization problem  $F(x) = \sin(x)$  and the range of design variable is:  $0 \leq x \leq \pi$ . Identify the best solution after two iterations and assume suitable data wherever required and specify the same. Consider total population size as 6 as follows

S.No	Population
1	0
2	$\pi/3$
3	$3\pi/4$
4	$2\pi/3$
5	$\pi/6$
6	$\pi/5$

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15. a) Explain the significance of Optimal Distributed Generation (DG) placement in Distribution System? Explain in detail procedure adopted for optimal Distributed Generation placement using Particle Swarm Optimization? 4 2 5 1,2,3,12

b) Explain algorithm steps used for Economic Load Dispatch problem without losses using any meta-heuristic technique? 4 3 5 1,2,3,12

16. a) Explain Perceptron model and its algorithm for Multi-output class? 4 1 1 1,2,3,12

b) Illustrate the rule base in Fuzzy logic system? For Load Frequency Control (LFC) problem, consider two inputs and one output with 5 membership functions. Define the rule base and draw the membership functions for inputs and output? 4 4 2 1,2,3,12

17. Answer any *two* of the following:

a) Describe the step-by-step implementation of Genetic Algorithm? 4 1 3 1,2,3,12

b) Compare Jaya algorithm and Particle Swarm Optimization (PSO) in terms of algorithm specific parameters, computation speed and global best with suitable justification? 4 2 4 1,2,3,12

c) Explain the need of reactive power compensation in a Distribution system. Explain optimal capacitor placement in a Distribution system using any meta-heuristic technique? 4 3 5 1,2,3,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	35%
iii)	Blooms Taxonomy Level - 3 & 4	45%

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