Hall Ticket Number:

Code No. : 18332 M N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade

B.E. (E.E.E.) VIII-Semester Makeup Examinations, July-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.	Draw the schematic of biological neuron and indicate various parts in it?	2	1	1	1,2,3,12
2.	In the 4 input ANN, the inputs are represented with $[X_1, X_2, X_3]$ and a bias, output is represented as Y, the weights between inputs and output are represented as $[W_1, W_2, W_3, b]$. The input and weight matrix are $[X_1, X_2, X_3] = [0.8, 0.6, 0.4]$ and $[W_1, W_2, W_3, b] = [0.1, 0.3, -0.2, 0.35]$. Evaluate the output of the neuron Y using Binary sigmoid activation function with steepness parameter (a) equals to 1?	2	3	1	1,2,3,12
3.	Draw the block diagram of fuzzy logic system?	2	1	2	1,2,3,12
4.	Explain Law of Excluded middle and Law of Contradiction properties of fuzzy sets with a neat sketch?	2	1	2	1,2,3,12
5.	Explain the importance of mutation in Genetic Algorithm?	2	2	3	1,2,3,12
6.	Illustrate Rank based selection method in Genetic Algorithm with the following data?	2	2	3	1,2,3,12

Chromosome No.	1	2	3	4	5
Fitness	0.7	0.2	0.6	0.2	0.8

| Q. No.	Stem of the question	M	L	CO	PO
7.	Identify local minima and global minima by plotting a non-linear function?	2	3	4	1,2,3,12
8.	Illustrate the difference between common control parameters and Algorithm specific parameters in stochastic optimization methods with suitable examples?	2	1	4	1,2,3,12
9.	Illustrate the advantages of optimal Distributed Generation (DG) placement in Distribution System?	2	1	5	1,2,3,12
10.	Explain the equality constraints and inequality constraints in optimal power flow problem?	2	1	5	1,2,3,12

Part-B (5 × 8 = 40 Marks)

11. a) Applying Back Propagation Algorithm to evaluate the new weights after one iteration, when the network illustrated in the Figure below is presented the input patter [0.4 -0.7] and the target output (O) is 0.1. Use learning rate =0.6, sigmoidal activation function with slope =1 for both hidden layer and output layer neurons? **[6 3 1 1,2,3,12]**

$$[V] = \begin{bmatrix} 0.1 & 0.4 \\ -0.2 & 0.2 \end{bmatrix}$$

$$[W] = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix}$$
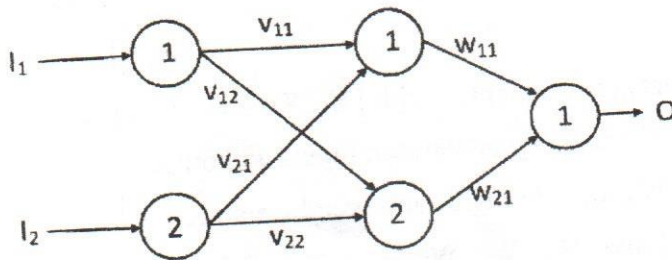
b) Explain Perceptron model and its algorithm for single output class? **[2 2 1 1,2,3,12]**

12. a) Explain any four types of membership function used in Fuzzy Logic System with a neat sketch and write their mathematical equation? **[4 1 2 1,2,3,12]**

b) Two fuzzy sets are given as **[4 3 2 1,2,3,12]**

$$A = \left\{ \frac{0.6}{X1} + \frac{0.5}{X2} + \frac{0.3}{X3} + \frac{0.2}{X4} \right\}$$

$$B = \left\{ \frac{0.4}{X1} + \frac{0.4}{X2} + \frac{0.5}{X3} + \frac{0.8}{X4} \right\}$$

Compute the following
(a) Multiplication of Fuzzy set A by crisp number 0.5
(b) Union of A and B
(c) Intersection of A and B
(d) Algebraic product of A and B

13. a) Explain any four types of crossover operations performed in Genetic Algorithm with examples **[2 2 3 1,2,3,12]**

b) Find the maximum value of function F(x) = Sin(x) using Genetic Algorithm at the end of two iterations. The range of x be [0, π]. Assume chromosome length of 10 bits, population size as 10. Perform single point crossover at 5th bit position. Perform mutation operation on 8th bit for any two solutions. Apply tournament selection method for parent selection. Assume Crossover probability, Elitism probability and Mutation probability as 0.9, 0.2 and 0.03 respectively. Assume data suitably wherever required and specify the same? **[6 3 3 1,2,3,12]**

14. a) Explain step-by-step implementation of Jaya optimization algorithm with suitable equations? **[3 2 4 1,2,3,12]**

	Question	M	L	CO	PO
b)	Apply Jaya Algorithm for solving the following optimization problem. Minimize $F(x_1, x_2) = x_1^2 + x_2^2$. The range of design variables are $-100 \leq x_1 \leq 100$ and $-100 \leq x_2 \leq 100$. Identify Best solution after performing two iterations. Assume suitable data wherever required.	5	3	4	1,2,3,12

Population No.	x_1	x_2
1	-5	18
2	14	63
3	70	-6
4	-8	7
5	-12	-18

|	Question	M	L	CO	PO
15. a)	Explain algorithm steps used for Economic Load Dispatch problem without losses using any meta-heuristic technique?	4	3	5	1,2,3,12
b)	Explain the significance of optimal power flow? Illustrate algorithm for optimal power flow using any optimization technique?	4	2	5	1,2,3,12
16. a)	What are the important terminologies used in the Artificial Neural Networks (ANN) and explain their significance?	4	2	1	1,2,3,12
b)	For the given figure below, evaluate the membership function value using centroid method?	4	3	2	1,2,3,12
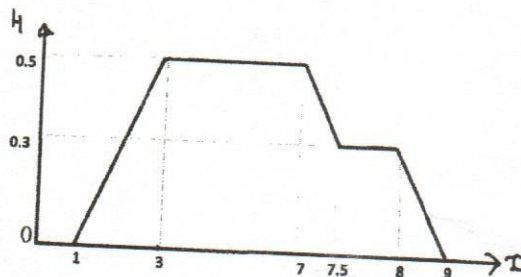
	Question	M	L	CO	PO
17.	Answer any *two* of the following:				
a)	With suitable examples, explain the following selection operations in Genetic Algorithm i. Roulette wheel method ii. Linear Ranking selection iii. Exponential Ranking selection iv. Tournament selection	4	2	3	1,2,3,12
b)	Explain step-by-step implementation of Particle Swarm optimization with suitable equations?	4	2	4	1,2,3,12
c)	Explain in detail procedure adopted for optimal Distributed Generation (DG) placement using Genetic Algorithm in distribution system?	4	2	5	1,2,3,12

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

i)	Blooms Taxonomy Level – 1	
ii)	Blooms Taxonomy Level – 2	20%
iii)	Blooms Taxonomy Level – 3 & 4	38.75%
		41.25%

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