Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2024

Fifth to Seventh Semester

18CSE352T – NEURO FUZZY AND GENETIC PROGRAMMING

(For the candidates admitted during the academic year 2018-2019 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. What kind of activation function is this? $y_{out}=f(y_{in})=\begin{cases}1, if\ y_{in}>0\\0, if\ y_{in}\le 0\end{cases}$ (A) Binary step function (B) Bipolar step function (C) Binary threshold function (D) Bipolar threshold function	1	1	1	2
2. In which type of neural network the output units are connected among themselves. (A) Feed forward neural network (B) Recurrent network (C) Competitive neural network (D) Multi layer neural network	1	1	1	1
3. The classification boundary realized by the perceptron is (A) Circle (B) Straight line (C) Parabola (D) Ellipse	1	1	1	1
4. Consider scenario $x_1=[-1-3\ 1]^T, W_1=-2, b_1=1, Y_1=1, \infty=2$, calculate new weight and bias for Hebbian learning rule (A) $W_2=[-3\ \ -5\ \ 1]\ b_2=2$ (B) $W_2=[3\ \ 5\ \ -1]\ b_2=2$ (C) $W_2=[-3\ \ -5\ \ 1]\ b_2=-2$ (D) $W_2=[3\ \ -5\ \ 1]\ b_2=2$	1	1	1	2
5. How many vectors can be stored in an n-input auto-associative net? (A) n – 1 (B) n (C) n + 1 (D) n – 2	1	1	2	1
6. During the training phase of a SOM, what is typically adjusted by control the rate at which neurons learn and adapt to the input data (A) Learning rate (B) Activation function (C) Bias weight (D) Number of neuron in the output layer	1	1	2	1
7. In LVQ, how are the prototype vectors adjusted during training to better represent the input data (A) Prototype are randomly reassigned (B) Prototype move towards the input vector (C) Prototype remain static throughout training (D) Prototype move away from the input vector	1	1	2	1

8. A Hopfield network with N neurons can perfectly store upto how many orthogonal patterns | 1 | 1 | 2 | 1

(A) N (B) N/2
(C) 2N (D) N^2

9. Consider 2 fuzzy set A and B defined on the same universe U and their T-norm (min) operation. If $\mu\_A(x)=0.8$ and $\mu\_B(x)=0.6$ for all element x in V what is the value of $\mu\_A\cap B(x)$ | 1 | 2 | 3 | 2

(A) 0.6 (B) 0.4
(C) 0.8 (D) 1

10. Given the propositional logic expression $P\vee(Q\wedge R)\,and\,(P\vee Q)\wedge(P\vee R)$, determine if they are logically equivalent | 1 | 1 | 3 | 2

(A) Cannot be determined with the provided information (B) Yes, they are equivalent
(C) No, they are not equivalent (D) Equivalent only under certain condition

11. Consider the membership function given below, if x = 55, what is $\mu A(x)$ | 1 | 2 | 3 | 2

$$\mu A(x)=\begin{cases}0, & if\ x<30\\ \frac{x-30}{40}, & if\ 30\le x\le 70\\ 1, & if\ x\ge 70\end{cases}$$

(A) 0.7 (B) 0.625
(C) 0.825 (D) 0.8

12. Which of the following is a relative fuzzy quantifier | 1 | 1 | 3 | 1

(A) Far below 10 (B) Somewhere around 325
(C) Almost (D) Nearly 100

13. An input of the fuzzy inference system is | 1 | 1 | 4 | 1

(A) A crisp value (B) A fuzzy value
(C) A fuzzy set (D) A linguistic variable

14. Find the consequence part of the given fuzzy rule "If temperature is high then cooling system activates" | 1 | 1 | 4 | 1

(A) If (B) Temperate
(C) High (D) Cooling system activation

15. If the trapezoidal membership function for the fuzzy set "Moderate" is defined by the point (2,0), (5,1), (8,1) and (10,0). What is the area of the trapezoidal region under this membership function? | 1 | 2 | 4 | 2

(A) 16 sq.units (B) 18 sq.units
(C) 20 sq.units (D) 22 sq.units

16. The neutral element of a T-conorm is | 1 | 1 | 4 | 1

(A) 0 (B) 1
(C) –1 (D) 0.5

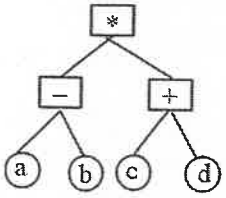
17. Find the order of the schema $10**0\ 1**1$ | 1 | 1 | 5 | 1

(A) 9 (B) 4
(C) 5 (D) 7

18. Which of the following encodes a solution to the given problem? 1 1 5 1

(A) Selection (B) Crossover
(C) Mutation (D) Chromosome

19. Write the LISP, S-expression for the tree shown below 1 2 5 2



(A) $(a-b)*(c+d)$ (B) $(-ab)*(+cd)$
(C) $(*(-ab)\,(+cd))$ (D) $((ab-)\,(cd+)*)$

20. In Holland classifier system, what is the main purpose of a classifier 1 1 5 1

(A) Representing an individual in the population (B) Controlling the mutation rate
(C) Specifying the selection criteria for crossover (D) Establishing the population size

PART – B (5 × 4 = 20 Marks) Marks BL CO PO
Answer **ANY FIVE** Questions

21. Design a HEBB NET to realize the logical AND function with initial bias b = 1. 4 2 1 2

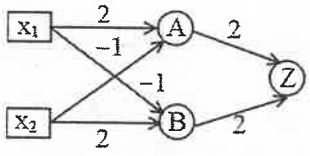
22. Determine the weighted matrix W of auto-associative net using Hebb rule for a vector S = [1 –1 –1 1]. 4 2 2 2

23. Find out whether the following formulae are equivalent $(a\rightarrow b)\rightarrow c$ and $a\rightarrow(b\rightarrow c)$. 4 2 3 2

24. Explain the core components of MANFIS and their roles in decision-making. 4 1 4 2

25. Briefly elaborate on the concept of Roulette wheel selection with example. 4 1 5 2

26. Find the function of the given MP net. 4 2 1 3



27. Define Voronoi tessellation with example. 4 3 1 2

PART – C (5 × 12 = 60 Marks) Marks BL CO PO
Answer **ALL** Questions

28. a. Design a perceptron to realize the NOR function. 12 2 1 2

(OR)

b. Design an MP-Neural model to realize logical XOR. 12 2 1 2

29. a. Find a Hetro-associative net to store 3 associations between pairs of pattern given below. — 2 2 3

P1 = [1, –1, 1, –1] : [–1, 1, –1]
P2 = [1, 1, 1, –1] : [1, 1, –1]
P3 = [1, –1, 1, 1] : [–1, 1, 1]

(i) Find the net weight matrix — 6

(ii) Compute the resultant net for an input x = [1, –1, 1, –1] — 6

(OR)

b. Compute the weight matrix of a Hopfield net and test its performance for a pattern S = [1,–1, 1, 1]. — 12 2 2 3

30. a.i. An engineer is testing the properties such as strength and weight of steel. Suppose he has 2 fuzzy set 'A', defines on a universe of 3 discrete strengths $\{S_1,S_2,S_3\}$ and set 'B' defines on a universe of 3 discrete weight $\{W_1,W_2,W_3\}$ suppose A and B represent a "high strength steel" and a "near optimum weight" as shown below. — 6 3 3 3

$$A=\left\{\frac{1}{S_1}+\frac{0.5}{S_2}+\frac{0.2}{S_3}\right\};\ B=\left\{\frac{1}{W_1}+\frac{0.5}{W_2}+\frac{0.3}{W_3}\right\}$$

Find the cartesian product that would represent the strength-to-weight characteristics of a near maximum steel quality.

ii. Let C be "moderately good" steel strength $C=\left\{\frac{0.1}{S_1}+\frac{0.6}{S_2}+\frac{1}{S_3}\right\}$ then compute CoR using max-min composition. — 6 3 3 3

(OR)

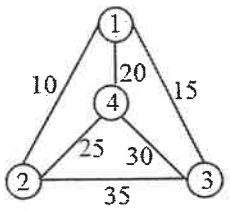
b. Let $low=\frac{1.0}{0}+\frac{0.5}{1}+\frac{0.2}{2}+\frac{0}{3}+\frac{3}{4}$, $high=\frac{0}{0}+\frac{0}{1}+\frac{0.2}{2}+\frac{0.3}{3}+\frac{1.0}{4}$ be a fuzzy set defined on a universe $u=v=\{0,1,2,3,4\}$. If R: if 'x is low' then 'y is high' be the fuzzy if-then rule and the promise is 'x is very low', then what is the conclusion? The fuzzy predicte 'very low' is to be interpreted as the set $very\ low=\frac{1.0}{0}+\frac{0.3}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}$. — 12 3 3 3

31. a. Design a fuzzy air conditioner controller and discuss what is the dial position for $\Delta T = +0.5$? — 12 3 4 3

(OR)

b. Explain the working principle of 2-output CANFIS architecture in detail. — 12 2 4 2

32. a. Compare and illustrate the concept of Roulette wheel selection and tournament selection using below TSP problem instance. — 12 3 5 2



(OR)

b. Illustrate and demonstrate genetic programming using Pythagorean theorem. — 12 2 5 2

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