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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**

Course Code: 22EE7PE3AI **Max Marks: 100**

Course: AI techniques in electrical power systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Define Hard Computing. Compare hard computing and soft computing.	*CO1*	*PO1*	**08**
	b)		Give a brief history of artificial intelligence.	*CO1*	*PO1*	**06**
	c)		What is an agent program? List out the basic elements for selection of agent types.	*CO1*	*PO1*	**06**
			OR			
2	a)		Illustrate any three approaches of Artificial Intelligence in detail.	*CO1*	*PO1*	**10**
	b)		Explain in detail about typical intelligent agents. (i) Goal based Agents. (ii) Utility based Agents.	*CO1*	*PO1*	**10**
			UNIT - II			
3	a)		Draw and explain Mc-Culloch pitts neuron architecture.	*CO1*	*PO1*	**07**
	b)		Determine the weights after three iterations for hebbian learning of a single neuron network starting with initial weight. $W = [1 \quad -1]$. Inputs $X_1 = \begin{bmatrix} 1 \\ -2 \end{bmatrix}, X_2 = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, X_3 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and c=1. Use bipolar binary activation function.	*CO1*	*PO2*	**08**
	c)		Difference between Multi-layers feed forward neural network and single layer feed forward network.	*CO1*	*PO1*	**05**
			OR			
4	a)		Explain Error back propagation training algorithm with help of a flowchart.	*CO2*	*PO2*	**10**

		b)	Implement XOR function using Mc-Culloch-pits neuron.	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Compare Mamdani and Sugeno fuzzy models.	*CO2*	*PO1*	**08**
		b)	Consider two given fuzzy sets $\underset{-}{A} = \left\{\frac{1}{2} + \frac{0.2}{3} + \frac{0.5}{4}\right\}$ $\underset{-}{B} = \left\{\frac{0.9}{2} + \frac{0.4}{3} + \frac{0.8}{4}\right\}$ Find (i) (a) A $\cup$ B (b) A $\cap$ B (c) $\overline{A}$ (d) $\overline{A} \cup B$.	*CO2*	*PO2*	**06**
		c)	With a neat sketch explain construction and working of Fuzzy inference system.	*CO2*	*PO1*	**06**
			OR			
	6	a)	Discuss any three methods for Defuzzifying fuzzy output functions in detail.	*CO2*	*PO2*	**05**
		b)	Define Crisp set. What are its properties?	*CO2*	*PO2*	**05**
		c)	Consider two fuzzy sets A and B. $A = \left\{\frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5}\right\}$ $B = \left\{\frac{0.5}{02} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5}\right\}$ (i) A∪B (ii) A∩B. (iii) Component of fuzzy set A. (iv) Difference $\frac{A}{B}$. (v) Algebraic sum of given fuzzy sets. (vi) Bounded sum of the given fuzzy set. (vii) Algebraic Product of the given sets. (viii) $\overline{A \cup B}$.	*CO2*	*PO2*	**10**
			UNIT - IV			
	7	a)	Consider a GA with chromosomes consisting of six genes x_i = abcdef , and each gene is a number between 0 and 9. Suppose we have the following population of four chromosomes: x_1 = 4 3 5 2 1 6 x_2 = 1 7 3 9 6 5 x_3 = 2 4 8 0 1 2 x_4 = 9 0 8 1 2 3 and let the fitness function be f(x) = (a + c + e) − (b + d + f). 1. Sort the chromosomes by their fitness 2. Do one-point crossover in the middle between the 1st and 2nd fittest, and two-points crossover (points 2, 4) for the 2nd and 3rd. 3. Calculate the fitness of all the offspring.	*CO2*	*PO2*	**10**

		b)	Discuss in detail about evolutionary programming methods with help of flowchart.	*CO2*	*PO2*	**10**
			OR			
	8	a)	How genetic algorithms differ from evolutionary programming and evolutionary strategies.	*CO2*	*PO1*	**10**
		b)	What are the various types of mutation techniques used in Genetic algorithm	*CO2*	*PO1*	**05**
		c)	Explain the steps for reproduction process in genetic algorithm.	*CO2*	*PO1*	**05**
			UNIT - V			
	9	a)	Design a fuzzy controller to regulate the temperature of a domestic shower. Assume that: (a) The temperature is adjusted by single mixer tap. (b) The flow of water is constant. (c) Control variable is the ratio of the hot to the cold water input. The design should clearly mention the descriptors used for fuzzy sets and control variables, set of rules to generate control action and defuzzification. The design should be supported by figures wherever possible.	*CO3*	*PO3*	**10**
		b)	Let U be the universe of military aircraft of interest as defined below. U = $\{a10, b52, c130, f2, f9\}$ Let $\underline{A}$ be the fuzzy set of bomber class aircraft. $\underline{A}=\left\{\frac{0.3}{a10}+\frac{0.4}{b52}+\frac{0.2}{c130}+\frac{0.1}{f2}+\frac{1}{f9}\right\}$ Let $\underline{B}$ be the fuzzy set of fighter class aircraft. $\underline{B}=\left\{\frac{0.1}{a10}+\frac{0.2}{b52}+\frac{0.8}{c130}+\frac{0.7}{f2}+\frac{0}{f9}\right\}$ Find the following (a) $\underline{A}\cup\underline{B}$ (b) $\underline{A}\cap\underline{B}$ (c) $\frac{\underline{A}}{\underline{B}}$ (d) $\overline{\underline{A}\cup\underline{B}}$ (e) $\overline{\underline{A}\cap\underline{B}}$. (f) $\overline{\underline{A}}$	*CO3*	*PO3*	**10**
			OR			
	10	a)	High speed rail monitoring devices sometimes make use of sensitive sensors to measure the deflection of the earth when a rail car passes. These deflections are measured with respect to some distance from the rail car and hence are actually very small angles measured in micro-radians. Let a universe of deflection be A=[1,2,3,4] where A is the angle in micro-radians and let a	*CO3*	*PO3*	**10**

universe of distance be D=[1,2,5,7] where D is distance in feet, suppose a relation between these two parameters has been determined as follows

R =

	D_1	D_2	D_3	D_4
A_1	1	0.3	0.1	0
A_2	0.2	1	0.3	0.1
A_3	0	0.7	1	0.2
A_4	0	0.1	0.4	1

Now let a universe of rail car weights be W = [1,2], where W is the weight in units of 1,00,000 rupees. Suppose the fuzzy relation of W to A is given by:

	W_1	W_2
A_1	1	0.4
A_2	0.5	1
A_3	0.3	0.1
A_4	0	0

Using these two relations, find the relation R^T o S=T.

(a) Using Max-min composition.

(b) Using max-product composition.

		b)	Explain the applications of neural networks in load forecasting.	*CO3*	*PO3*	**10**

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