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

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 19EE6PE3AI **Max Marks: 100**
Course: AI Techniques to Power System **Date: 17.07.2023**

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

		UNIT - I	CO	PO	Marks
1	a)	Explain the methods that illustrate the approaches of artificial intelligence in detail (i) Laws of thought method (ii) Cognitive modelling method	*CO1*	*PO1*	**10**
	b)	Define Agent. What are the basic elements for selection of agent types. Describe the taxi driver agent.	*CO1*	*PO1*	**10**
		UNIT - II			
2	a)	A neuron with 3 inputs has the weight vector W = [0.1 0.3 -0.2]. The activation function is binary sigmoidal. If input vector is [0.8 0.6 0.4] then find the output of neuron.(Assume λ=1).	*CO2*	*PO3*	**06**
	b)	Determine the weights after three iterations for hebbian learning of a single neuron network starting with initial weight. $W = [1 \quad -1]^t$ Inputs $X_1 = \begin{bmatrix} 1 \\ -2 \end{bmatrix}, X_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, X_3 = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, X_4 = \begin{bmatrix} 0 \\ -1 \end{bmatrix}$ and c=1. Use (i) bipolar binary activation function. (ii) Bi-polar continuous activation. .(Assume λ=1).	*CO2*	*PO3*	**10**
	c)	List out the important properties of activation function used in neural networks.	*CO2*	*PO2*	**04**
		OR			
3	a)	Use Perception learning rule to train the network. The set of input training vectors are as follows. $X_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} \quad X_2 = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix} \quad X_3 = \begin{bmatrix} -1 \\ 1 \\ 0.5 \\ -1 \end{bmatrix} \quad W_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix}$	*CO2*	*PO3*	**10**

			The initial weight vector W_1 and learning constant c=0.1. The desired response for X_1, X_2 and X_3 are d_1=-1, d_2=-1 and d_3=1 respectively. Calculate the weights after one complete cycle.			
		b)	Differentiate between artificial neural network and biological neural networks.	*CO2*	*PO2*	**05**
		c)	Explain the advantages and dis-advantages of neural networks.	*CO2*	*PO2*	**05**
			UNIT - III			
	4	a)	Consider two given fuzzy sets $\underset{\sim}{A} = \left\{\frac{1}{2} + \frac{0.3}{4} + \frac{0.5}{6} + \frac{0.2}{8}\right\}$ $\underset{\sim}{B} = \left\{\frac{0.5}{2} + \frac{0.4}{4} + \frac{0.1}{6} + \frac{1}{8}\right\}$ Perform union, intersection, difference and complement over the fuzzy sets A and B.	*CO2*	*PO3*	**06**
		b)	Consider a local area network (LAN) of interconnected workstations that communicate using Ethernet protocols at a maximum rate of 12 Mbits/s. The two fuzzy sets given below represent the loading of the LAN. $\mu_S(x) = \left\{\frac{1.0}{0} + \frac{1.0}{1} + \frac{0.8}{2} + \frac{0.2}{5} + \frac{0.1}{7} + \frac{0.0}{9} + \frac{0.0}{10}\right\}$ and $\mu_C(x) = \left\{\frac{0.0}{0} + \frac{0.0}{1} + \frac{0.0}{2} + \frac{0.5}{5} + \frac{0.7}{7} + \frac{0.8}{9} + \frac{1.0}{10}\right\}$ Where S represent silent and C represent congestion. Perform algebraic sum, algebraic product, bounded sum and bounded difference over the two fuzzy sets.	*CO2*	*PO3*	**06**
		c)	Let R be the relation that specifies the relationship between "colour of afruit and "grade of maturity. Relation S specifies the relationship between " grade of maturity and "taste of a fruit", where colour, grade and taste of a fruit. are characterized by crisp sets x,y,z respectively as follows. X = {green, yellow, red}. Y = {verdant, half mature, mature}. Z = {sour, tasteless, sweet}. Consider following relations R and S and find the relationship between "colour and taste" of a fruit using. 1.Max-min Composition. 2.Max-product composition. **R** | **Verdant** | **Half mature** | **Mature** **Green** | 1 | 0.5 | 0 **Yellow** | 0.3 | 1 | 0.4 **Red** | 0 | 0.2 | 1	*CO2*	*PO3*	**08**

			<table><tr><th>S</th><th>Sour</th><th>Tasteless</th><th>Sweet</th></tr><tr><td>Verdant</td><td>1</td><td>0.2</td><td>0</td></tr><tr><td>Half mature</td><td>0.7</td><td>1</td><td>0.3</td></tr><tr><td>Mature</td><td>0</td><td>0.7</td><td>1</td></tr></table>			
		UNIT - IV			
5	a)	Write a note on the following control parameters of genetic algorithm. (i) Mutation. (ii) Replacement.	*CO2*	*PO2*	**10**
	b)	Comment on the parent selection in evolution strategies and evolution programming.	*CO2*	*PO2*	**10**
		OR			
6	a)	Explain the different parent selection methods in evolutionary systems.	*CO2*	*PO2*	**08**
	b)	A genetic algorithm uses chromosomes of the form x = abcdefgh with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: f (x) = (a + b) − (c + d) + (e + f) − (g + h) and let the initial population consist of four individuals with the following chromosomes: x_1 = 6 5 4 1 3 5 3 2 x_2 = 8 7 1 2 6 6 0 1 x_3 = 2 3 9 2 1 2 8 5 x_4 = 4 1 8 5 2 0 9 4 a) Evaluate the fitness of each individual, showing all your workings and arrange them in order with the fittest first and the least fit last. b) Perform the following crossover operations: i) Cross the fittest two individuals using one–point crossover at the middle point. ii) Cross the second and third fittest individuals using a two–point crossover (points b and f). iii) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover. c) Suppose the new population consists of the six offspring individuals received by the crossover operations in the above question. Evaluate the fitness of the new population, showing all your workings. Has the overall fitness improved? d) By looking at the fitness function and considering that genes can only be digits between 0 and 9 find the chromosome representing the optimal solution (i.e. with the maximum fitness). Find the value of the Maximum fitness.	*CO2*	*PO3*	**12**

			UNIT - V			
	7	a)	Design a fuzzy controller for a train approaching or leaving a station, the inputs are distance from a station and speed of thee train. The output is brake power used. Use, (i) Triangular membership functions (ii) Four descriptors for each variables. (iii) Two rules. (iv) Appropriate defuzzification method.	*CO3*	*PO3*	**10**
		b)	Describe the applications of neural networks in load forecasting.	*CO3*	*PO3*	**10**

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