KUMARAGURU
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Register Number:……….……

M.E DEGREE EXAMINATIONS: JUNE 2017

(Regulation 2015)

Second Semester

EMBEDDED SYSTEM TECHNOLOGIES

P15ESTE04 : Intelligent Control

COURSE OUTCOMES

CO1: Describes various soft computing required for developing intelligent systems.

CO2: Outlines the concept of ANN and genetic algorithm and its role in modelling system behaviour.

CO3: Applies the knowledge of fuzzy logic techniques to analyze the system behaviour with the support of development tools.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assertion (A): A: supervised learning is performed with the help of a teacher.   CO2 [K_1]

   Reason (R): In supervised learning the correct target output values are known for each input pattern

   a) Both A and R are Individually true and R is the correct explanation of A
   b) Both A and R are Individually true but R is not the correct explanation of A
   c) A is true but R is false
   d) A is false but R is true

2. Each connection link in ANN is associated with _____ which has information about the input signal.   CO2 [K_1]

   a) neurons
   b) weights
   c) bias
   d) activation function

3. The room temperature is hot. Here the hot (use of linguistic variable is used) can be represented by   CO3 [K_2]

   a) Fuzzy set
   b) Crisp set
   c) Logic set
   d) Logic family

4. Matching the following with the correct choices: CO1 [K_1]

List I	List II
A. ANN	i. Mutation
B. Genetic Algorithm	ii. Pattern Recognition
C. Fuzzy Logic	iii. Crisp set
D. Probability	iv. Linguistic Variables

	A	B	C	D
a)	ii	i	iv	iii
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

5. Assertion (A): A network with a single linear unit is called an Adaline. CO2 [K$_1$]

   Reason (R): Adaline uses binary activation for its input signals and its target output.

   a) Both A and R are Individually true and R is the correct explanation of A
   b) Both A and R are Individually true but R is not the correct explanation of A
   c) A is true but R is false
   d) A is false but R is true

6. How is Fuzzy Logic different from conventional control methods? CO3 [K$_1$]

   a) IF and THEN Approach
   b) FOR Approach
   c) WHILE Approach
   d) DO Approach

7. Which of the following is true ? CO2 [K$_1$]

   (i) On average, neural networks have higher computation rates than conventional computers.

   (ii) Neural networks learn by example

   (iii) Neural networks mimic the way the human brain works

   a) (i),(ii) and (iii)
   b) (ii) and (iii)
   c) (i) and (ii)
   d) (i) only

8. Perceptron can learn CO2 [K$_1$]

   a) AND
   b) XOR
   c) Both a and b
   d) XNOR

9. Which AI system will continue to analyze a problem until it finds the best solution? CO3 [K$_1$]

   a) Genetic algorithm
   b) Neural network
   c) Fuzzy logic
   d) PSO

10. Arrange the following in the correct order for implementing Hebb rule: CO2 [K$_2$]

    1) For each training target input output vector pairs s:t, perform steps 2-4.

    2) Set all the initial weights to zero.

       $W_{ij} = 0$ (i= 1 to n, j = 1 to m)

    3) Activate the input layer units to current training input

       $X_i = S_i$ (i = 1 to n)

    4) Start the weight adjustment

       $W_{ij(new)} = W_{ij(old)} + x_i \, y_j$

    5) Activate the output layer units to current target output.

       $Y_j = t_j$ (j= 1 to m)

a)	2-1-3-5-4	b)	1-3-2-4-5
c)	3-4-5-2-1	d)	4-1-3-5-2

PART B (10 x 2 = 20 Marks)

11.	What is meant by hybrid computing?	CO1	[K$_1$]
12.	Compare hard computing and soft computing.	CO1	[K$_1$]
13.	Compare biological neuron with artificial neuron.	CO2	[K$_1$]
14.	Name the different types of activation functions used in learning.	CO2	[K$_1$]
15.	Find the power set and cardinality of the given set X={2,4,6}. Also find cardinality of power set.	CO3	[K$_2$]
16.	Explain the following two properties of a fuzzy set: i) Distributivity ii) Idempotency	CO3	[K$_2$]
17.	Explain with example uniform crossover in genetic algorithm.	CO2	[K$_1$]
18.	What is meant by mutation in genetic algorithm?	CO2	[K$_1$]
19.	What are the functions of the following instructions in MATLAB? gaoptimget , gaoptimset, optimoptions.	CO2	[K$_2$]
20.	What is the function of fuzzy inference system?	CO2	[K$_1$]

PART C (6 x 5 = 30 Marks)

21.	Discuss about the drawbacks of traditional optimization methods.	CO1	[K$_1$]
22.	Describe the Adaline network training algorithm in detail.	CO2	[K$_2$]
23.	Explain about sugeno fuzzy models with neat diagram.	CO3	[K$_1$]
24.	Consider the two given fuzzy sets	CO3	[K$_2$]

$$A = \left\{ \frac{1}{2} + \frac{0.3}{4} + \frac{0.5}{6} + \frac{0.2}{8} \right\}$$

$$B = \left\{ \frac{0.5}{2} + \frac{0.4}{4} + \frac{0.1}{6} + \frac{1}{8} \right\}$$

Perform union, intersection and complement over fuzzy sets A and B.

25.	Explain the convergence criteria for genetic algorithm along with GA cycle.	CO2	[K$_1$]
26.	Explain how fuzzy controller is implemented using MATLAB tool box.	CO3	[K$_2$]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Take any maximization problem with some objective function and some constraints. Apply genetic algorithm to find its maximum value in first generation.   CO2   [K$_3$]

28. With neat flowchart and equations explain the back propagation algorithm for training a neural network.   CO2   [K$_2$]

29. Find the weights using perceptron network for ANDNOT function when all the inputs are presented only one time. Use bipolar inputs and targets.   CO2   [K$_3$]

30. The discretized membership functions for a transistor and a resistor are given below: CO3   [K$_2$]

$$\mu_T = \left\{ \frac{0}{0} + \frac{0.2}{1} + \frac{0.7}{2} + \frac{0.8}{3} + \frac{0.9}{4} + \frac{1}{5} \right\}$$

$$\mu_R = \left\{ \frac{0}{0} + \frac{0.1}{1} + \frac{0.3}{2} + \frac{0.2}{3} + \frac{0.4}{4} + \frac{0.5}{5} \right\}$$

Find the following:

    (a) Algebraic sum   (b) Algebraic Product   (c) Bounded sum

    (d) Bounded difference.

31. Explain how to implement a neural network controller of any non-linear system using MATLAB toolbox.   CO3   [K$_2$]

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