KUMARAGURU
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Register Number:……………………..

B.E DEGREE EXAMINATIONS: APRIL 2015

(Regulation 2009)

Seventh Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

EIE116: Applied Soft Computing

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. An example of competitive learning is
   a) Perceptron learning rule b) Winner take all learning rule
   c) Delta learning rule d) Hebbian learning rule
2. ---------------- layer of ART network is a competitive layer
   a) F1(a) b) F1(b)
   c) F2 d) Reset
3. ----------- learning rule is used in back propagation training algorithm.
   a) Hebbian b) Delta
   c) Perceptron d) Winner take all
4. ------------- characteristics is exhibited by soft limiting activation function.
   a) Linear b) Inverse
   c) Sigmoidal d) Trapezoidal
5. Cross over point of a membership function is defined as the elements for which
   a) $\mu(x)=1$ b) $\mu(x)=0.5$
   c) $0<\mu(x)<1$ d) $\mu(x)=0.25$
6. Cardinality of fuzzy set is
   a) Finite value b) Infinity
   c) Always One d) Zero
7. A fuzzy relation is called as tolerance relation if it exhibits following properties
   a) reflexivity and symmetry b) reflexivity, symmetry and transitivity
   c) symmetry and transitivity d) reflexivity and transitivity

8. Converting a crisp quantity to fuzzy is

a) defuzzification
b) fuzzification
c) Normalisation
d) Fuzzy composition

9. - ----------- type of fuzzy inference is not computationally efficient.

a) kosko
b) zadeh
c) mamdani
d) sugeno

10. ------------------- is the method for fitness evaluation in genetic algorithm

a) Mutation
b) Crossover
c) Roulette wheel
d) All the above

PART B (10 x 2 = 20 Marks)

11. Define activation function and bring out its types.

12. Train the neural network using the input vector $x_1 = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$. Find the final weights for bipolar continuous f(net) using Hebbian learning rule for $\lambda=1$ and c= 1 assuming the initial weights to be $W^1=[\,1 \;\; -1]^{t.}$

13. List the applications of neural networks(any 4).

14. Define vigilance parameter in ART network.

15. Differentiate between classical set and fuzzy set.

16. Define alpha cut for a fuzzy set.

17. List the different techniques for fuzzy decision making.

18. List nay two properties of a fuzzy set.

19. Define mutation.

20. Define neuro fuzzy controller.

PART C (5 x 14 = 70 Marks)

21. a) (i) Discuss back propagation training algorithm with a relevant diagram (8)

(ii) Describe the architecture of ART1 network (6)

(OR)

b) (i) Consider a Kohonen net with two cluster units and five input units. The weight vectors for the cluster units are (6)
w_1=(1.0, 0.8, 0.6, 0.4, 0.2) and w_2=(0.2, 0.4, 0.6, 0.8, 1.0)
Use the square of the Euclidean distance to find the winning cluster unit for the pattern x=(0.5, 1.0, 0.5, 0.0, 0.0).
Using a learning rate of 0.2, find the weights for the winning unit.

(ii) Explain the architecture of discrete Hopfield neural network and write an algorithm to train the network. (8)

22. a) Explain the different schemes of neurocontrol in detail.

(OR)

b) With a neat diagram discuss how artificial neural network can be used for process identification with respect to feed farward and plant inverse identification. (8)

Write short notes on parameterized neuro controller. (6)

23. a) (i) A new optical microscope camera uses a look up table to relate voltage readings which are related to illuminance to exposure time. To aid in the creation of this lookup table, we need to determine how much time the camera should expose the pictures at a certain light level. Define a fuzzy set "around 3 volts" on a universe of voltage readings in volts (10)

$$V = \left\{\frac{0.1}{2.98} + \frac{0.3}{2.99} + \frac{0.7}{3} + \frac{0.4}{3.01} + \frac{0.2}{3.02}\right\}$$

and a fuzzy set "around 1/10 second " on a universe of exposure time in seconds

$$T = \left\{\frac{0.1}{0.05} + \frac{0.3}{0.06} + \frac{0.3}{0.07} + \frac{0.4}{0.08} + \frac{0.5}{0.09} + \frac{0.2}{0.1}\right\}$$

Find the fuzzy relation R= V x T.

Now define a third universe of "stops".In photography, stops are related to making the picture some degree lighter or darker than the average exposed picture. Let Universe of stops be {-2,-1.5,-1.0,0,0.5,1,1.5,2}.We will define a fuzzy set on this universe as

$$Z = \left\{\frac{0.1}{0} + \frac{0.7}{0.5} + \frac{0.3}{1}\right\}$$

Find S= T x Z.

Find M=R $_o$ S by max-min and max-product composition.

(ii) Define fuzzy relation and list the operations of fuzzy relation (4)

(OR)

b) (i) Explain decomposition of rules and aggregation of rules (8)

(ii) Let A and B be fuzzy sets $A=\left\{\frac{1}{1.0}+\frac{0.75}{1.5}+\frac{0.3}{2}+\frac{0.15}{2.5}+\frac{0}{3.0}\right\}$, (6)

$B=\left\{\frac{1}{1.0}+\frac{0.6}{1.5}+\frac{0.2}{2.0}+\frac{0.1}{2.5}+\frac{0}{3.0}\right\}$. Find the following

(1)$A \cup B$ (2)$A \cap B$ (3)$A|B$ (4)$\overline{A \cup B}$ (5)$\overline{A \cap B}$ (6)$\bar{A} \cup A$

24. a) (i) Illustrate the different methods of defuzzification. (10)

(ii) Bring out the different types of membership function. (4)

(OR)

b) (i) Explain the steps involved in the design of FLC (7)

(ii) Explain in detail the concept of adaptive fuzzy system (7)

25. a) Write notes on

(i) Fuzzy neuron

(ii) Neuro fuzzy controller

(OR)

b) Explain the role of genetic algorithm with respect to optimization of membership function and rule base.

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