KUMARAGURU
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B.E. DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulations 2009)

Seventh Semester

ELECTRONICS AND INSTRUMENTATION ENGG

EIE116: Applied Soft Computing

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

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1.   Back propagation algorithm is used for

   (a) Hopfield network   (c) Multilayer perceptron

   (b) Kohnen's self organizing maps   (d) Single layer perceptron

2.   The learning process(es) used in an artificial neural network is/are

   (a) Hebbian learning   (c) (a) and (b)

   (b) Perceptron learning   (d) none of the above

3.   The following is/are the schemes of Neuro-control

   (a) Supervised control   (c) (a) and (b)

   (b) Direct inverse control   (d) none of the above

4.   Identification is

   (a) tuning the controller parameters   (c) a type of control

   (b) estimating the system parameters   (b) obtaining the system parameters

5.   A fuzzy set is

   (a) has membership values in [0,1]   (c) another name for a conventional set

   (b) a set with values in [0,1]   (d) has membership values in {0,1}

6.   Which one of the following operation is not applicable for fuzzy sets?

   (a) Union   (b) Intersection

   (c) Intersection of the fuzzy set with its (d) Complement

      complement is a null set

7. The fuzzification block in the fuzzy logic controller
   (a) converts the crisp input to the fuzzy input
   (b) converts the fuzzy input to the fuzzy output
   (c) converts the fuzzy output to the crisp output
   (d) converts the crisp input to the crisp output

8. The defuzzification block in the fuzzy logic controller
   (a) converts the crisp input to the fuzzy input
   (b) converts the fuzzy input to the fuzzy output
   (c) converts the fuzzy output to the crisp output
   (d) converts the crisp input to the crisp output

9. A genetic algorithm is
   (a) only used in artificial neural networks only
   (b) only used in fuzzy logic control
   (c) a stochastic optimization technique
   (a) a deterministic optimization technique

10. The genetic algorithm, in fuzzy logic, can be used for optimizing
    (a) the rule base
    (b) the membership functions
    (c) the rule base as well as the membership functions
    (d) none of the above

PART B (10 x 2 = 20 Marks)

11. Sketch the model of an artificial neuron.
12. What is meant by activation function in an ANN?
13. What is adaptive neuro control?
14. What is neuro fuzzy control?
15. Define a fuzzy set.
16. What is a fuzzy relation?
17 Name any one defuzzification technique with its mathematical relations.
18 Name any two advantages of a fuzzy controller over a conventional controller.
19 What is evolutionary computation?
20 Name any two techniques of elementary computation.

PART C (5 x 14 = 70 Marks)

21. a) With a neat diagram, explain how back progation algorithm is used to train multilayer feed forward networks.

    (OR)

    b) (i) Explain the Kohnen self-organizing neural network. (7)

    (ii) Discuss the training of Hopfield network. (7)

22. a) Explain the differeat schemes of neurocontrol with neat block diagrams.

    (OR)

    b) How will you identify and control a dynamical system with ANN? Describe with a neat block diagram.

23. a) (i) You are assigned the task of identifying images in an overhead reconnaissance photograph. You design computer software to do image processing of local objects within a scene. Define two fuzzy sets representing a car and a truck image: (9)

$$car = \left\{ \frac{0.5}{truck} + \frac{0.4}{motorcycle} + \frac{0.3}{boat} + \frac{0.9}{car} + \frac{0.1}{house} \right\}$$

$$truck = \left\{ \frac{1}{truck} + \frac{0.1}{motorcycle} + \frac{0.4}{boat} + \frac{0.4}{car} + \frac{0.2}{house} \right\}$$

Find the following:

(i) $car \cup truck$,   (ii) $car \cap truck$,   (iii) $\overline{car}$,   (iv) $\overline{car \cup truck}$,

(v) $\overline{car \cap truck}$, (vi) $car \cup \overline{car}$

(ii) Give the fuzzy representation of the temperature in a classroom in Coimbatore over a year. (5)

(OR)

b) (i) Consider the following fuzzy relations

$$R(X,Y) = \begin{bmatrix} 0.7 & 0.5 \\ 0.8 & 0.4 \end{bmatrix} \qquad S(Y,Z) = \begin{bmatrix} 0.9 & 0.6 & 0.2 \\ 0.1 & 0.7 & 0.5 \end{bmatrix}$$
(9)

Find the relation $T(X,Z)$ using max-min and max-product compositions.

(ii) With an example, explain how a fuzzy set is different from a crisp set. (5)

24 a) (i) With a neat block diagram of a fuzzy logic controller (FLC), explain the (8) different blocks and working of an FLC.

(ii) Give the steps in the design of a fuzzy logic controller for the control of (6) temperature in a furnace.

(OR)

b) (i) Figure 24(b) (i) shows the results of three implications. Find the defuzzified output using the following methods (i) centre of gravity, (ii) centre of sums (10) and (iii) weighted average.
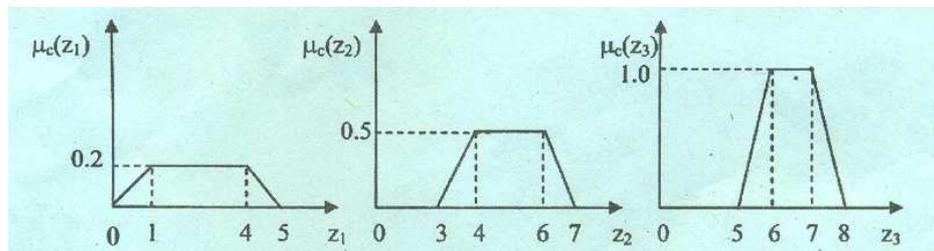

Figure 24(b) (i)

(ii) What is a Mamdani fuzzy inference system? Describe with an example. (4)

25 a) (i) Elaborate on different types of fuzzy neuron. (10)

(ii) Inplement fuzzy transfer function in ANN. (4)

(OR)

b) (i) What is meant by optimization? Why should you optimize the membership (4) functions and rule base of a fuzzy logic controller?

(ii) Explain, with diagrams, how you will optimize the membership functions and (10) rule base of a fuzzy logic controller for a process.

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