Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : P 1362

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Seventh Semester

Instrumentation and Control Engineering

IC 1403 — NEURAL NETWORK AND FUZZY LOGIC CONTROL

(Common to Electronics and Instrumentation Engineering)

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Sketch the biological neuron and name its parts.

2. List any two learning rules used for training Artificial Neural Network (ANN).

3. Differentiate : Feed forward and feed back networks.

4. List any two applications of ANN.

5. What is meant by fuzzification?

6. Give any two methods used for defuzzification.

7. What are the operations involved in optimization using genetic algorithm?

8. What is the use of membership function?

9. Mention a few applications of FLC.

10. Highlight two main features of Neuro–fuzzy controller.

PART B — (5 × 16 = 80 marks)

11. (a) (i)   Prove that the single layer neural network cannot solve problems which are not linearly separable. (10)

         (ii) Differentiate : supervised learning and unsupervised learning. (6)

Or

     (b) (i)   What are the various steps involved in Back Propagation Algorithm (BPA) used for training ANN? (6)

         (ii) Write the two weight updating equations used in Back Propagation Algorithm. (4)

         (iii) Briefly explain the local minima and global minima with respect to BPA. (6)

12. (a) (i)   Explain how an ANN can be used for process identification. (10)

         (ii) Sketch the Hopfield network and brief its working. (6)

Or

     (b) (i)   Explain in detail the design of a neural controller for controlling the position of inverted pendulum, with the help of neat block diagram. (12)

         (ii) Justify the need for neural controller for the above application. (4)

13. (a) (i)   Differentiate a classical set and a fuzzy set with the help of a suitable example. (6)

         (ii) Fuzzy sets A and B are defined on the universal set

               $X = \{x_1, x_2, x_3, x_4, x_5\}$ as

               $A = \dfrac{0.2}{x_1} + \dfrac{0.6}{x_2} + \dfrac{0.7}{x_3} + \dfrac{0.9}{x_4}$

               $B = \dfrac{0.3}{x_1} + \dfrac{0.5}{x_2} + \dfrac{0.2}{x_3} + \dfrac{0.8}{x_4} + \dfrac{0.1}{x_5}$

               Find the level sets and distinct alpha cuts of the fuzzy sets A and B. (10)

Or

     (b) (i)   What is the need for defuzzification? (2)

         (ii) Why is 'centre of area method' preferred for defuzzification? (2)

         (iii) Illustrate the centre of area method of defuzzification with the help of a suitable example. (12)

2   P 1362

14. (a) (i) Demonstrate with the help of a suitable example the working of decision making logic block to obtain a single truth value. (10)

   (ii) Explain the role of ANN in the manipulation of membership function. (6)

Or

(b) (i) Explain the working of genetic algorithm with respect to optimization. (6)

   (ii) What is the need for adaptive fuzzy system? Explain the design of adaptive fuzzy system for a system of your choice. (2 + 8)

15. (a) (i) Justify the hybridization of ANN and FLC. (leading to the neuro–fuzzy controller). (4)

   (ii) Design a FLC for a home heating system. (12)

Or

(b) Explain from fundamentals, the design of FLC for controlling blood pressure during anesthesia, with the help of neat block diagram, flow chart, specimen response curves and tables giving the FLC parameters. (4 + 4 + 4 + 4)

_____