Before answering the question paper the candidate should ensure that they have been supplied the correct question paper. Complaints in this regard, if any, shall not be entertained after the examination.

Note: Question No. 1 is Compulsory and attempts any two questions from each section. All questions carry equal marks.

1. a) What are the four main steps in back propagation algorithm? (4x5=20)
   b) Define approximate reasoning.
   c) List the properties of fuzzy sets.
   d) Define Back Propagation Network (BPN)
   e) Briefly design fuzzification & de-fuzzification.

2. a) Define learning rule. Demonstrate using an example to conclude the comparison between the supervised and un-supervised learning algorithm? (10)
   b) Explain the major differences between a conventional (serial) computer and a neural network. (10)

3. a) Explain about the basic Hop field model. (10)
   b) What do you mean by K-means clustering algorithm? (10)

4. a) Draw the block diagram of fuzzy logic. Explain in brief the basic concepts of fuzzy logic control. (10)
   b) Briefly explain the application of neural networks in pattern recognition.(10)

5. a) Design a Fuzzy Logic controller for Automatic ECG Analyzer. (15)
   b) Differentiate between classical and fuzzy sets. (5)

6. a) Using Max-Min compositions operation, the matrix expression for the crisp relation can be found in fig. Relation matrices for R and S would be expressed as (15)

   \[
   R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad S = \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}
   \]

   Find \( T = R \circ S \)

   b) What do you mean by universal set? (5)

7. Write short notes on the following: (10x2=20)
   a) Kohonen self organizing maps.
   b) Fuzzy If-Then Rules.