Duration – 3 Hrs.   **Max Marks (80)**

Note : Question No. 1 is compulsory.
Assume suitable data if required
Attempt any three questions from the remaining questions

Q 1   Differentiate   20
a. Hard and Soft computing
b. Fuzziness and Probability
c. Linear and Non linear Separability
d. Crisp membership and Fuzzy membership

Q 2 (a) What is the role of activation functions in a neural network? Explain   10
commonly used functions with mathematical representation and graph.

Q 2 (b) What is the role of membership functions? Give the mathematical model for   10
Gaussian function. Show the effect of different transformations on it.

Q 3 (a) Explain SOM architecture. With an example give the step by step learning   10
by SOM.

Q 3 (b) Explain the generalized delta rule and its role in the back propagation   10
algorithm.

Q 4 (a) Define composition relation for a Fuzzy set.   10

Given: A={Jack, Lucy, Harry}, B={Flute, Drum, Violin, Piano}, C={String,
Wind, Percussion}.

For the relation R=plays$\subseteq PXQ$ and S= instrument type $\subseteq QXR$ defined as
follows, find R∘S.

Relation matrix for R

	R			
	Flute	Drum	Violin	Piano
Jack	0	1	0	1
Lucy	1	0	1	1
Harry	1	1	1	0

Turn Over

691A54CAB1BACD4A7A3F52499EBBC50C

Relation for S

	S		
	String	Wind	Percussion
Flute	0	1	0
Drum	0	0	1
Violin	1	0	0
Piano	1	0	0

Q 4 (b)   Define deep learning. Explain historical context of deep learning.   10

Q 5 (a)   Describe rough membership. List the properties satisfied by rough   10
          membership functions.

Q 5 (b)   What is perceptron? Explain. Design a multi-layer perceptron to solve the   10
          XOR problem.

Q 6   Explain briefly any two   10

          a.   Fuzzy-Neural systems

          b.   RBF

          c.   Fuzzy Inference Systems