(3 Hours) **[Total Marks: 80]**

N.B.: 1) **Question No. 1 is compulsory.**
2) Attempt **any three** from the remaining questions.
3) Draw neat and clean diagram wherever required.
4) Figure to the right indicate full marks
5) Use of calculator is allowed

Q.1 a) Differentiate between Hard Computing and Soft Computing. [5]
b) Describe Agent and its properties with suitable diagram. [5]
c) Using Zadeh's notation, determine the following for the given fuzzy sets: [5]

$$A = \left\{ \frac{1}{1.0} + \frac{0.75}{1.5} + \frac{0.3}{2.0} + \frac{0.15}{2.5} + \frac{0}{3.0} \right\} ; \quad B = \left\{ \frac{1}{1.0} + \frac{0.6}{1.5} + \frac{0.2}{2.0} + \frac{0.1}{2.5} + \frac{0}{3.0} \right\}$$

Express the following for $\lambda = 0.55$
1) $A \cup B$ 2) $A \cap \bar{B}$ 3) $A \cup \bar{A}$ 4) $\bar{A} \cap \bar{B}$ 5) $\overline{A \cap B}$

d) Differentiate between Supervised Learning and Unsupervised Learning. [5]

Q.2 a) Explain the different types of knowledge representations schemes with the help of suitable example. [10]
b) With the help of the neat diagram, explain Adaptive Linear Neuron (Adaline) network model. Explain in brief Adaline training algorithm. [10]

Q.3 a) Define state space search for the following problem: [10]
We are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which we can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can we get exactly 2 gallons of water in the 4-gallon jug?
b) What is defuzzification? Explain in brief any two methods of defuzzification along with suitable example. [10]

Q.4 a) What is Fuzzy Interface System (FIS)? Explain it along with its type. [10]
b) Consider two fuzzy sets R and S [10]

	Y1	Y2			Z1	Z2	Z3
R = X1	0.6	0.3	S=	Y1	1	0.5	0.3
X2	0.2	0.9		Y2	0.8	0.4	0.7

Find i) Max Min composition (R ₒ S)
ii) Max Product Composition (R • S)

Q.5 a) Discuss architecture of perceptron with training algorithm for single output   [10]
          classes.

     b) Explain in brief any two methods of membership value assignments.   [10]

Q.6 a) What is Genetic Algorithm? Explain crossover and mutation operator in GA.   [10]

     b) Short Note on **any two**   [10]
          i)   AND-OR Graph
          ii) Breadth First Search
          iii) Operation performed on Crisp Set

_____