

(3 hours)

(80 marks)

- Note: 1) Question 1 is compulsory.
 2) Attempt any four from Question 2 to Question 7.
 3) Draw neat and clean diagrams wherever required.
 4) Figures to the right indicate marks.

- Q.1 A) What is learning? Explain in brief Reinforcement learning. 5
 B) What is crossover? Explain with suitable example single point and two point crossover. 5
 C) Differentiate between Hard Computing and Soft Computing 5
 D) Using Zadeh's notation, determine the λ -cut sets for the given fuzzy sets: 5

$$A = \left\{ \frac{0}{0} + \frac{0.5}{20} + \frac{0.65}{40} + \frac{0.85}{60} + \frac{1.0}{80} + \frac{1.0}{100} \right\}$$

$$B = \left\{ \frac{0}{0} + \frac{0.45}{20} + \frac{0.6}{40} + \frac{0.8}{60} + \frac{0.95}{80} + \frac{1.0}{100} \right\}$$

Express the following for $\lambda = 0.5$

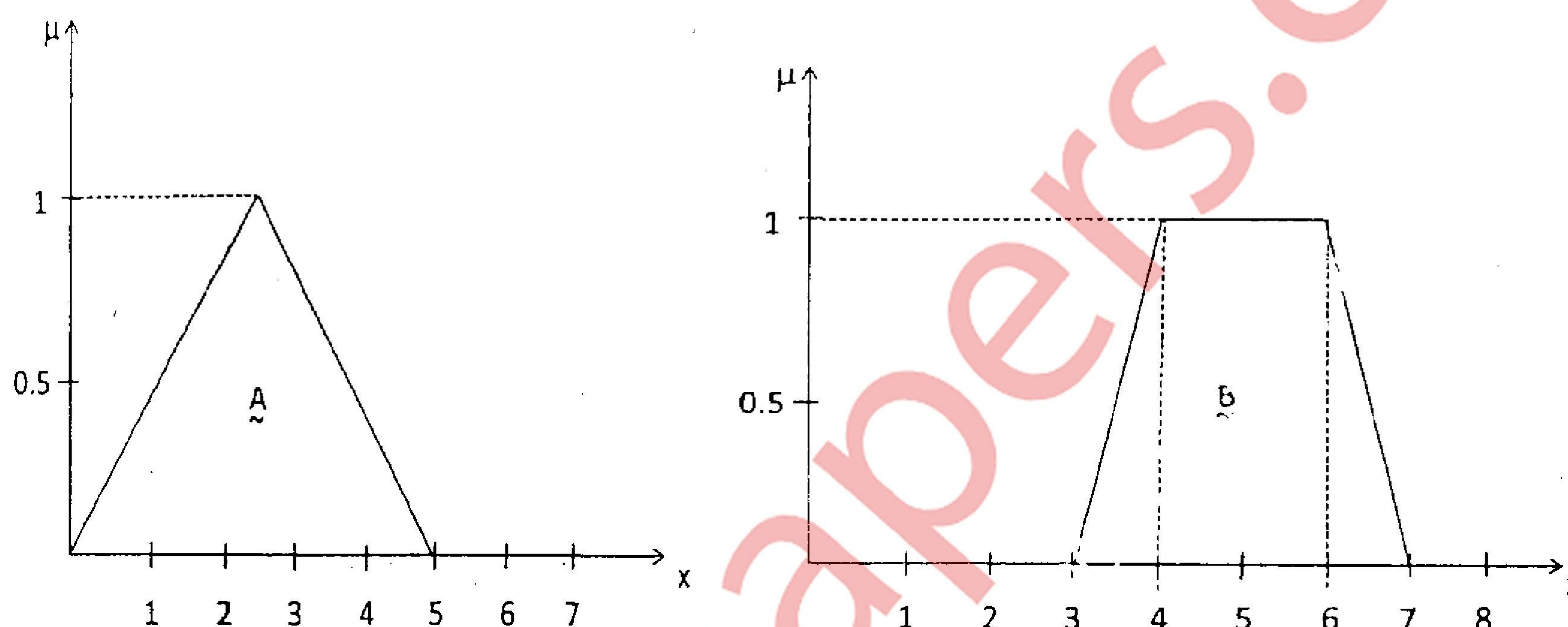
1. $A \cap B$ 2. $A \cup B$ 3. $\overline{A \cup B}$ 4. $\overline{A \cap B}$ 5. $A \cap \overline{A}$

- Q.2 A) How is genetic algorithm different from traditional algorithm? Explain general genetic algorithm. 8
 B) What is Fuzzy Inference System (FIS)? With suitable block diagram, explain the working principles of an FIS. 7
- Q.3 A) What is fuzzy decision making? Explain in brief any three decision making models. 8
 B) What is fuzzy approximate reasoning? Explain different modes of fuzzy approximate reasoning. 7
- Q.4 A) Consider two fuzzy sets R and S 8
- | | | | | | | | | |
|-----|----|-----|-----|-----|----|-----|-----|-----|
| | | Y1 | Y2 | | Z1 | Z2 | Z3 | |
| R = | X1 | 0.7 | 0.6 | S = | Y1 | 0.8 | 0.5 | 0.4 |
| | X2 | 0.8 | 0.3 | | Y2 | 0.1 | 0.6 | 0.7 |
- Find the relation $T = R \circ S$ using Max-min composition and Max-product composition.
- B) Explain in brief architecture of Fuzzy Logic Controller (FLC). 7

Q.5 A) What is membership function? List various methods employed for the membership value assignment. Explain any two in brief. 8

B) Explain with suitable example mathematical operations performed on intervals. 7

Q.6 A) For the logical union of membership functions shown below find the defuzzified value x^* using centroid, weighted average, first of maxima and last of maxima methods. 3



B) With the help of neat diagram explain Adaptive Linear Neuron (Adaline) network model. Explain in brief Adaline training algorithm. 7

Q.7 Write short note on **any three** 15

- A) Applications of Soft Computing
- B) Associative memory network
- C) Selection methods in GA
- D) Set operations performed on fuzzy interval
- E) Neuron connection architectures