

(2 hours)

[Total Marks: 50]

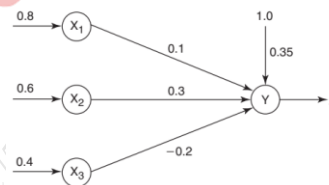
- N. B.: (1) **All** questions are **compulsory**.
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
 (3) Answers to the **same question** must be **written together**.
 (4) Numbers to the **right** indicate **marks**.
 (5) Draw **neat labeled diagrams** wherever **necessary**.
 (6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt any two of the following:**10**

- Distinguish between hard computing and soft computing.
- What is bi-directional associative memory? List the activation functions used in bidirectional associative memory.
- Write a short note on Fuzzy Logic.
- State the advantages and limitation of genetic algorithm.

2. Attempt any two of the following:**10**

- Define Soft Computing. State various type of soft computing techniques and explain any two types in details.
- Obtain the output of the neuron Y for the network shown in figure given below using activation functions as: (i) binary sigmoidal and (ii) bipolar sigmoidal.



- With suitable diagram explain the concept of linear separability with OR function.
- Explain the training phase of the Back-propagation algorithm.

3. Attempt any two of the following:**10**

- What is spiking neural networks? Explain Izhikevich Neuron Model.
- Discuss the important features of Kohonen self-organizing maps.
- Write a short note on Optical Neural Network.
- What is Mexican Hat? Draw and explain its structure in detail.

4. Attempt any two of the following:**10**

- Define convex and non-convex fuzzy set. Explain the angular fuzzy set method of fuzzification in details.
- What is fuzzy measure? State and explain the axioms of fuzzy measures & and properties of Borel field.
- What is fuzzy composition? Consider the two fuzzy relation R and S given below. Compute Max-min composition.

$$R = \begin{matrix} & y_1 & y_2 \\ \begin{matrix} x_1 \\ x_2 \end{matrix} & \begin{bmatrix} 0.6 & 0.3 \\ 0.2 & 0.9 \end{bmatrix} \end{matrix} \quad S = \begin{matrix} & z_1 & z_2 & z_3 \\ \begin{matrix} y_1 \\ y_2 \end{matrix} & \begin{bmatrix} 1 & 0.5 & 0.3 \\ 0.8 & 0.4 & 0.7 \end{bmatrix} \end{matrix}$$

- What is Lambda cut in fuzzy set? Explain strong and weak Lambda cut in detail with suitable example.

5. Attempt any two of the following:**10**

- What is fuzzy logic controller? State and explain the components of FLC
- Write a short note on neuro-fuzzy hybrid systems.
- With suitable example, explain one-point and two-point crossover techniques in details.
- Discuss in details the four modes of approximate reasoning.