

(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:

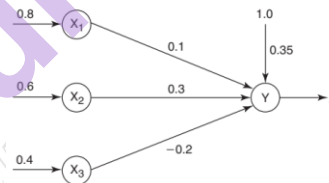
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- Distinguish between hard computing and soft computing.
- What is bi-directional associative memory? List the activation functions used in bidirectional associative memory.
- Write a short note on Fuzzy Logic.
- State the advantages and limitation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

2. Attempt any two of the following:

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- 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:

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- 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:

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- 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:

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- 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.