

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID-SEMESTER EXAMINATION SP/2025)

CLASS: BTECH
BRANCH: EEE

SEMESTER: VI
SESSION: SP/2025

SUBJECT: EE449 ARTIFICIAL INTELLIGENCE FOR ELECTRICAL ENGINEERING
TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and a total of 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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|---|-----|-----|-----|
| Q.1(a) What are the merits and demerits of the main constituents of soft computing? | [2] | CO | BL |
| Q.1(b) What do you mean by Hybrid Intelligent System? Mention its advantages. | [3] | CO1 | BL1 |
| Q.2(a) Explain the analogy between biological neural network (BNN) and artificial neural network (ANN). | [2] | CO1 | BL2 |
| Q.2(b) Discuss the key differences between ANN, Fuzzy systems, and GA. | [3] | CO1 | BL3 |
| Q.3(a) What is Generalized neuron (GN) model? Explain Summation-type GN model. | [2] | CO2 | BL3 |
| Q.3(b) For a neuron whose activation function is a sigmoid function | [3] | CO2 | BL3 |

$$f(x) = \frac{1}{1 + e^{-\lambda x}}$$

Prove that the derivative of $f(x)$ with respect to x is given as

$$f'(x) = \lambda \cdot f(x)(1 - f(x))$$

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|--|-----|-----|-----|
| Q.4(a) What do you mean by the learning process in ANN? Briefly explain different types of learning processes. | [2] | CO2 | BL2 |
| Q.4(b) Derive the formula for weight update rule for the Backpropagation learning algorithm. | [3] | CO2 | BL3 |
| Q.5(a) Differentiate between randomness and fuzziness. | [2] | CO3 | BL2 |
| Q.5(b) For the two fuzzy sets \tilde{A}_1 and \tilde{A}_2 | [3] | CO3 | BL3 |

$$\tilde{A}_1 = \left\{ \frac{0.3}{1} + \frac{0.7}{1.5} + \frac{0.3}{2} + \frac{0.15}{2.5} + \frac{0}{3} \right\}$$

$$\tilde{A}_2 = \left\{ \frac{1}{1} + \frac{0.4}{1.5} + \frac{0.6}{2} + \frac{0.1}{2.5} + \frac{0}{3} \right\}$$

Find

- (a) $\tilde{A}_1 \cup \tilde{A}_2$
- (b) $\tilde{A}_1 \cap \tilde{A}_2$
- (c) $\overline{\tilde{A}_1}$
- (d) $\overline{\tilde{A}_2}$

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