2025

COMPUTER SCIENCE — HONOURS

Paper : DSE-B-3

(Introduction to Computational Intelligence)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.*** **1** and ***any four*** from the rest.

1. Answer ***any five*** questions : 2×5

(a) Differentiate between Fuzzy set and Crisp set.

(b) Mention two advantages of A* algorithm.

(c) What do you mean by semi-supervised learning?

(d) Differentiate between uninformed and informed search.

(e) Define Rough set.

(f) Differentiate between strong AI and weak AI.

(g) What do you mean by activation function in Artificial Neural Network?

2. (a) Explain Breadth-First Search algorithms with suitable example.

(b) Discuss about the time complexity of Depth First Search.

(c) Why is Depth First Search not optimal? 6+2+2

3. (a) What do you mean by Artificial Neural Network? Give an example.

(b) Compare Artificial Neural Network with Biological Neural Network.

(c) What is the learning rate in Artificial Neural Network training? How does it affect convergence?

(d) Explain the basic steps of back propagation algorithm. 2+2+(2+1)+3

4. Two fuzzy sets are given as :

$$\tilde{A} = \left\{ \frac{0.6}{2} + \frac{0.5}{3} + \frac{0.8}{4} + \frac{0.2}{5} + \frac{0.6}{6} \right\}$$

$$\tilde{B} = \left\{ \frac{0.5}{2} + \frac{0.8}{3} + \frac{0.4}{4} + \frac{0.7}{5} + \frac{0.9}{6} \right\}$$

Find the following :

(a) $\tilde{A}^C$

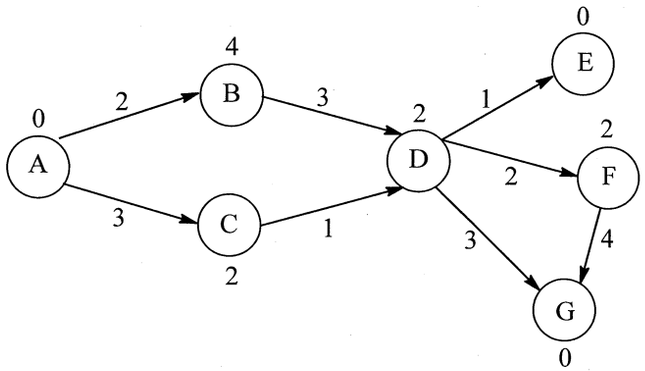
(b) $\tilde{B}^C$

(c) $\left(\tilde{A} \cup \tilde{B}\right)^C$

(d) $\left(\tilde{A} \cap \tilde{B}\right)^C$

(e) $\tilde{A}^C \cap \tilde{B}^C$. 2+2+2+2+2

5. (a) Apply A* algorithm on the following graph taking start node A and goal node G :



Clearly show all the steps.

(b) Why is A* algorithm considered optimal? 7+3

6. (a) What is a heuristic function? How is it used in informed search?

(b) Explain the concept of state space representation with an example.

(c) Why is iterative deepening search preferred over DFS and BFS in some cases? (2+2)+3+3

7. (a) Describe minimax algorithm for two-player zero sum games.

(b) How are game trees used in AI problem solving?

(c) What is alpha-beta prunning? How are they used in AI problem solving? 4+2+4

8. Write short notes on (***any two***) : 5×2

(a) Hopfield networks

(b) Training data set

(c) Gradient Descent method

(d) Fuzzy Relation.
