

2024

COMPUTER SCIENCE — HONOURS

Paper : DSE-B-3 and DSE-B-4

*The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

DSE-B-3

(Introduction to Computational Intelligence)

Full Marks : 50

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

1. Answer *any five* questions :

2×5

- (a) Define fuzzy membership function.
- (b) What do you mean by state space search?
- (c) Differentiate between supervised and unsupervised learning.
- (d) Mention two differences between Artificial Neural Network and Biological Neural Network.
- (e) Why is Depth First Search not optimal?
- (f) Differentiate between Declarative knowledge and Procedural knowledge.
- (g) What do you mean by Fuzzy inference?
- (h) What is the function of backward propagation phase in back propagation network?

2. (a) Give a brief comparison of data driven search and goal driven search.

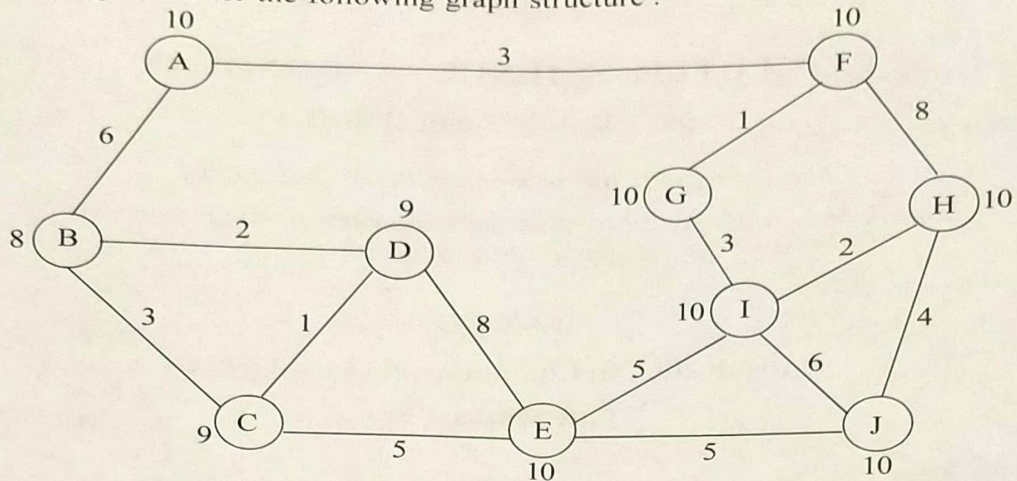
(b) How is knowledge represented in a Rule based system? Give an example.

(c) Differentiate between Fuzzy set and Rough set.

4+3+3

Please Turn Over

3. (a) Apply A* algorithm for the following graph structure :



(b) Why is A* search algorithm preferred for goal state?

8+2

4. (a) Let, two reference sets are $X = \{m, n\}$ and $Y = \{p, q, r\}$. Fuzzy sets A and B are defined on them as,

$$A = \{(m, 0.3), (n, 0.7)\}$$

$$B = \{(p, 0.5), (q, 0.1), (r, 0.8)\}$$

Find $A \times B$.

(b) What do you mean by a fuzzy proposition? Explain with proper example.

(c) Two fuzzy sets are given as,

$$A = \{(x, 0.3), (y, 0.9), (z, 0.4), (w, 0.6)\}$$

$$B = \{(x, 0.5), (y, 0.7), (z, 0.3), (w, 0.8)\}$$

Find $(A \cup B)^c$. Also verify $A \cap A' \neq \phi$.

3+3+(2+2)

5. (a) How is game theory important in AI?

(b) Write down the steps for minmax algorithm and illustrate with a suitable example.

2+(5+3)

6. Two fuzzy sets are given as :

2×5

$$\tilde{A} = \{(x_1, 0.5), (x_2, 0.7), (x_3, 0)\}$$

$$\tilde{B} = \{(x_1, 0.8), (x_2, 0.2), (x_3, 1)\}$$

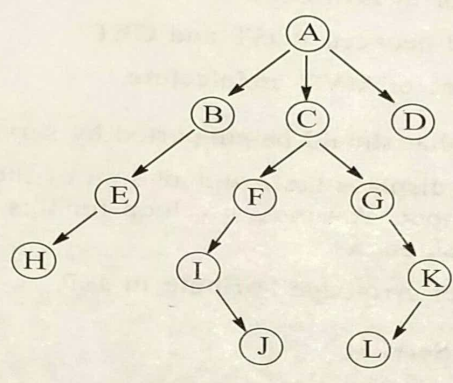
Find the following :

(a) \tilde{A}^c

(b) \tilde{B}^c

- (c) $(\bar{A} \cup \bar{B})^c$
- (d) $(\bar{A} \cap \bar{B})^c$
- (e) $\bar{A}^c \cup \bar{B}^c$

- 7. (a) How is knowledge represented in a semantic network? Explain with an illustrative example.
(b) Draw the structure of a single layer perceptron model. Briefly explain all of its components.
(c) What do you mean by a linearly separable set of patterns in machine learning? 4+4+2
- 8. (a) In the context of knowledge representation using Frames, explain how the following concepts can be represented :
 - (i) Inheritance
 - (ii) Mutual exclusion.
- (b) Explain the working procedure of Iterative Deepening Depth First Search (IDDFS) using the following graph :



Consider, starting node A and goal node G. (2+2)+6