

MCS–224

MASTER OF COMPUTER APPLICATION (MCAOL)
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Time: Three Hours

Maximum Marks: 100

Note: There are three Sections in the question paper A, B, C. Learners are required to attempt each section. The number questions attempted in each section are mentioned separately.

Section–A ($5 \times 4 = 20$)

Note: Attempt any five questions from Question No. 1 to 7. Each question carries 4 marks.

1. Briefly discuss any two of the following three categories of Artificial Intelligence, with suitable example for each:

- i) Artificial Narrow Intelligence
- ii) Artificial General Intelligence
- iii) Artificial Super Intelligence

2. Define an Intelligent Agent. What are the properties an agent is supposed to possess?

3. Transform the following formula into prenex normal form (PNF):

$$(\forall x)(Q(x) \rightarrow (\exists x)R(x, y))$$

4. Discuss the scenario when one should use forward chaining or backward chaining for a given problem.
5. Briefly discuss feed-forward neural network (FNN) with the help of a suitable diagram.
6. Why one should use Dimensionality Reduction and how can it be accomplished? Discuss in brief.
7. For the following fuzzy sets:

$$A = \left\{ \frac{a}{.4}, \frac{b}{.6}, \frac{c}{.2}, \frac{d}{.7}, \frac{e}{.9} \right\}$$

$$B = \left\{ \frac{a}{.2}, \frac{b}{.5}, \frac{c}{.3}, \frac{d}{.8}, \frac{e}{.7} \right\}$$

find the fuzzy sets:

i) $A \cup B$

ii) $A \cap B$

iii) $A' \cap B'$

iv) $(A \cap B)'$

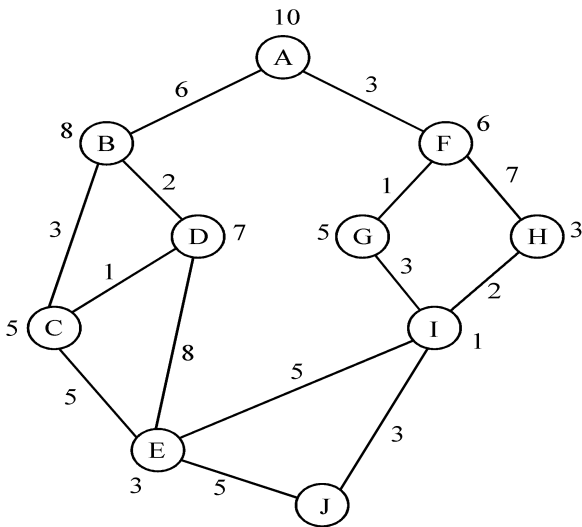
Section-B ($5 \times 10 = 50$)

Note: Attempt any five questions from Question No. 8 to 14. Each question carries 10 marks.

8. Compare the concept of classification, regression and clustering. List the algorithms in respective categories.

9. What are the four main criteria used commonly to evaluate any search algorithm? Also, discuss the depth-first search algorithm.

10. Apply A* algorithm to find the most cost-effective path to reach from start state A to final state J. The numbers written on nodes represent the heuristic value and the numbers written on edges represent the distance between the nodes :



11. a) Derive the conjunctive normal form (CNF) of the expression:

$$\sim Z \wedge \sim ((\sim X) \rightarrow (\sim Y))$$

b) Explain the concept of Resolution with suitable example.

12. With the help of a suitable example, prove the following properties hold for fuzzy sets:

i) Commutativity

ii) Associativity

iii) Distributivity

iv) De Morgan's Law

13. Define Semantic network and draw the semantic network representation for the fact: “X cuts an apple for Y in the garden with a sharp knife last week.”

14. With the help of a suitable example, explain the K-Nearest Neighbors (KNN) classification algorithm.

Section–C (2×15=30)

Note: Attempt any two questions from Q. No. 15 to 17. Each question carries 15 marks.

15. What is Decision Tree Induction? Explain ID3 algorithm for creating decision tree with the help of an suitable example.

16. Consider the following set of data points (x, y) . Find the 2nd order polynomial $y = a_0 + a_1x_i + a_2x_i^2$, using polynomial regression, determine the value of y when x is 30 :

x : 40 10 -20 -88 -150 -170

y : 5.89 5.99 5.98 5.54 4.3 3.33

17. Write short note on the following:

i) K-means clustering

ii) Agglomerative clustering

iii) Divisive clustering