

**Bharati Vidyapeeth's**  
**Institute of Computer Applications and Management (BVICAM)**  
 A-4, Paschim Vihar, New Delhi-63  
**THIRD SEMESTER [MCA] Internal Examination, September 2023**

Paper Code: MCA-203

Subject: Artificial Intelligence and Machine Learning

Time: 2 Hours

Maximum Marks: 45

**Note: Attempt THREE questions in all. Question No. 1 is compulsory, and attempt one question from each unit.**

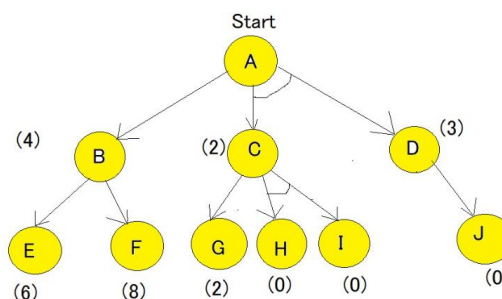
1. Answer all the following questions briefly: - 1.5 × 10 = 15
- (a) Differentiate between Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL). CO1
- (b) Explain the purpose of Turing Test. CO1
- (c) Summarize four main approaches to Artificial Intelligence. CO1
- (d) Explain Artificial Intelligence based on functionality. CO1
- (e) Compare Local maxima and Global maxima in Hill Climbing Algorithm. CO1
- (f) Propositional logic has very limited expressive power, thus first order predicate logic is used. Justify the statement. CO2
- (g) What are various inference rules? Explain. CO2
- (h) Outline the concept of non-monotonic reasoning with example. CO2
- (i) Compare and contrast procedural knowledge and declarative knowledge CO2
- (j) Differentiate Forward Versus. Backward Reasoning. CO2

**UNIT - I**

2. (a) Trace the constraint satisfaction procedure to solve the following cryptarithmic problem: 5 CO1

$$\begin{array}{rcccc}
 & S & E & N & D \\
 + & M & O & R & E \\
 \hline
 M & O & N & E & Y \\
 \hline
 \end{array}$$

- (b) Consider the graph below: 5 CO1



Apply AO\* algorithm to reach cost effective solution. Consider in the above example all numbers in brackets are the heuristic value i.e  $h(n)$ . Each edge is considered to have a value of 1 by default i.e.  $g(n)$ .

- (c) Given an initial and final state of 8 puzzle problem. Find the most cost-effective path to reach the final state from initial using A\* algorithm. 5 CO1

Initial State		
1	2	3
8		4
7	6	5

Goal State		
2	8	1
	4	3
7	6	5

3. (a) Analyze the Travelling Salesman Problem (TSP) with respect to the seven problem characteristics. 5 CO1
- (b) Define state spaces in AI. Why are they useful? Write state space for any suitable problem of your choice. 5 CO1
- (c) Trace the constraint satisfaction procedure to solve the following cryptarithmic problem: 5 CO1

$$\begin{array}{r}
 \text{C R O S S} \\
 + \text{R O A D S} \\
 \hline
 \text{D A N G E R} \\
 \hline
 \end{array}$$

### UNIT - II

4. (a) Translate each of the following sentence into First Order Logic (FOL). 5 CO2
1. Every connected and circuit-free graph is a tree.
  2. Not all that glitters is gold.
  3. Some numbers are not real.
  4. There is a barber who shaves all men in the town who do not shave themselves.
  5. Someone has visited every country in the world except Libya.
- (b) Check the validity of the following implications via truth table. 5 CO2
- $P \rightarrow (Q \rightarrow R)$  equivalent to  $(P \rightarrow Q) \rightarrow (P \rightarrow R)$**
- (c) What are forward and backward search planning? Explain with the help of example. 5 CO2
5. (a) Explain the following term providing an example 5 CO2
1. Modus Ponens
  2. Modus Tollens
- (b) Summarize approaches to Knowledge Representation (KR). 5 CO2
- (c) Show that the following propositions are valid. 5 CO2

**$[\forall xP(x) \rightarrow Q]$  equivalent to  $[\exists xP(x) \rightarrow Q]$**

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