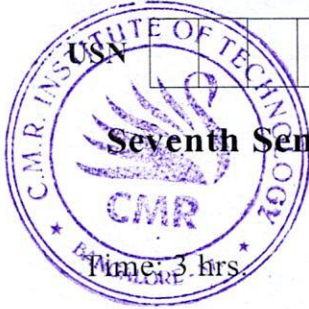


CBCS SCHEME

21CS752



Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Introduction to AI and ML

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Artificial Intelligence. Explain the below approaches to Artificial Intelligence with respective definitions.
i) Acting Humanly ii) Thinking Humanly (10 Marks)
b. Define Agent. With a neat diagram, explain how agents interact with environment through sensors and actuators. (10 Marks)

OR

- 2 a. Explain the structure of an agent program with an example agent program. (10 Marks)
b. With a neat diagram and agent function, explain the following :
i) Simple Reflex Agents ii) Goal Based Agents (10 Marks)

Module-2

- 3 a. Illustrate with an example, the components of a Well-defined problem. (10 Marks)
b. What are Toy problems and Real-world problems? Explain the formulation of vacuum world problem with a neat diagram of its state space. (10 Marks)

OR

- 4 a. Explain Breadth-First search strategy with a pseudocode for BFS on a graph and simple binary tree. (10 Marks)
b. What is Heuristic search? Explain greedy best-first search with an example. (10 Marks)

Module-3

- 5 a. Discuss different types of Machine Learning with example. (10 Marks)
b. Explain Machine Learning process with a neat diagram. (10 Marks)

OR

- 6 a. Write a note on :
i) Elements of big data ii) Types of data (10 Marks)
b. Explain 4-layer architecture of big data analysis framework. (04 Marks)
c. Write a note on Data Preprocessing step of Big Data processing cycle. (06 Marks)

Module-4

- 7 a. Explain Bivariate data with an example. (03 Marks)
b. Define covariance and correlation. Find the covariance and correlation coefficient of data.
 $X = \{1, 2, 3, 4, 5\}$ and $Y = \{1, 4, 9, 16, 25\}$ (07 Marks)
c. Write the procedure for applying Gaussian elimination method. Solve the following set of equations using Gaussian elimination method:

$$2x_1 + 4x_2 = 6$$

$$4x_1 + 3x_2 = 7$$

(10 Marks)

OR

- 8 a. Write Find-S algorithm. Apply Find-S algorithm on the below dataset that contains details of the performance of students and their likelihood of getting a job offer or not in their final semester.

CGPA	Interactiveness	Practical Knowledge	Communication Skills
≥ 9	Yes	Excellent	Good
≥ 9	Yes	Good	Good
≥ 8	No	Good	Good
≥ 9	Yes	Good	Good
Logical Thinking	Interest	Job Offer	
Fast	Yes	Yes	
Fast	Yes	Yes	
Fast	No	No	
Slow	No	Yes	

- (10 Marks)
 b. List the limitations of Find-S algorithm. (03 Marks)
 c. Write K-Nearest-Neighbors (K-NN) algorithm. (07 Marks)

Module-5

- 9 a. What are artificial neurons? Describe the structure of a single neuron with a neat diagram. (04 Marks)
 b. Explain simple model of an artificial neuron. (08 Marks)
 c. Write and explain Perceptron algorithm. (08 Marks)

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OR

- 10 a. Elaborate on the types of Artificial Neural Networks. (10 Marks)
 b. Write and explain the algorithm for Radial Basis Function Neural Network. (10 Marks)

1>		
a>	Artificial Intelligence is the simulation of human intelligence processes by machines, especially computer systems. AI is one of the newest fields in science and engineering.	②
i>	<u>Acting Humanly</u>	②
	2 Definitions of AI:	
	Explanation of Turing test approach and total turing test	②
ii>	<u>Thinking Humanly</u>	②
	2 Definitions of AI	
	Explanation of the cognitive modeling approach	②
b>		10M
	An agent is a computer program that operate autonomously, percieve their environment, persist over a prolonged time period, adapt to change and create and pursue goals.	
	<u>OR</u>	
	An agent is anything that can be viewed as perceiving its environments through sensors and acting upon that environment through actuators.	②
	Page 3 / 10	Microsoft Teams

2>		10M
a>	Explanation of structure of agent program including definitions of <u>agent function</u> , <u>agent program</u> and <u>architecture</u>	④
	agent = architecture + program	
	Example agent function	③
	Explanation of example agent function	③
		10M

b>

i> Simple Reflex Agents

Explanation of simple reflex agents

Diagram

Agent function of Simple-Reflex-Agent

→ ②

→ ③

→ ⑧

5M

ii> Goal-Based Agents

Explanation of goal-based agents

Diagram

Agent function of goal-based agent

→ ②

→ ②

→ ①

5M

21

Example of BFS on a simple binary tree

→ ②

10M

b>

Definition of Heuristic search

Explanation of greedy best-first search

Explanation of algorithm with an example

→ ②

→ ⑤

→ ③

MODULE - 2

10M

3>

a> Explanation on the components of a problem.

Initial state, Actions, transition model, state space, path, goal-test, path cost, step-cost, solution.

⑤

Explanation of components of a well-defined problem with an example.

→ ⑤

10M

b>

Definitions of toy problems and real-world problems.

→ ②

The diagram of state space for the vacuum world

→ ④

Explanation of the components of the vacuum world problem.

→ ④

10M

4(a)

Explanation of BFS search strategy	→	(2)
pseudocode for BFS on a graph with explanation	→	(6)
Example of BFS on a simple binary tree	→	(2)
		10M
b> Definition of Heuristic search	→	(2)
Explanation of greedy best-first search	→	(5)
Explanation of algorithm with an example	→	(3)
<u>MODULE-3</u>		10M
5> a> Explanation of		
- Supervised learning	→	(3)
- Unsupervised learning	→	(3)
- Semisupervised learning	→	(2)
- Reinforcement learning	→	(2)
		10M

b> Diagram of Machine learning process	→	(4)
Explanation of 6 steps		
- Understanding business		
- Understanding the data	→	(6)
- preparation of data		
- Modelling		
- Evaluate		
- Deployment		
		10M
6> a> i> Elements of big data explanation		
- Volume		
- Velocity		
- Variety		
- Veracity of data	→	(5)
- Validity		
- Value		
ii> Types of Data explanation		
- Structured data		
- Record data		
- Data matrix	→	(3)
- Graph data		
- Ordered data		
- Unstructured data	→	(1)
- Semi-structured data	→	(1)

6) b) Diagram of Machine learning process	Explanation of 6 steps - Understanding business - Understanding the data - preparation of data - Modelling - Evaluate - Deployment ii) Elements of big data explanation - Volume - Velocity - Variety - Veracity of data - Validity - Value iii) Types of Data explanation - Structured data - Record data - Data matrix - Graph data - Ordered data - Unstructured data - Semi-structured data	→ ④ → ⑥ 10M → ⑤ → ③ → ① → ①
7) a) Bivariate data involves two variables. It deals with cause of relationships. The aim is to find relationships among data.		10M → ①
b) Definition of covariance Definition of correlation $X = \{1, 2, 3, 4, 5\}$ $Y = \{1, 4, 9, 16, 25\}$ $\text{COV}(X, Y) = \frac{1}{N} \sum_{i=1}^N (x_i - E(X))(y_i - E(Y))$ Applying the equation, <u>Covariance = 12</u> $r = \frac{\text{COV}(X, Y)}{\sigma_X \sigma_Y}$ Applying the equation, correlation coefficient = 0.984	→ ① → ① steps → ⑤	

87

a) Steps of Find-s algorithm

→ ⑤

For the given dataset,

Step 1:

 $h = \langle \phi \ \phi \ \phi \ \phi \ \phi \ \phi \rangle$

Step 2:

I1: ≥ 9 Yes Excellent Good Fast Yes +ve instance~~h~~ ≥ 9 Yes Excellent Good Fast Yes >

Step 3:

I2: ≥ 9 Yes Good Good Fast Yes +ve instance $h = \langle \geq 9 \text{ Yes } ? \text{ Good Fast Yes} \rangle$

→ ⑤

I3: ≥ 8 NO Good Good Fast NO -ve instance $h = \langle \geq 9 \text{ Yes } ? \text{ Good Fast Yes} \rangle$ I4: ≥ 9 Yes Good Good slow NO +ve instance~~h~~ ≥ 9 Yes ? Good ? ? > $h = \langle \geq 9 \text{ Yes } ? \text{ Good } ? \ ? \rangle$

It includes all +ve instances and obviously ignores any -ve instance

104

b)

List of three limitations of Find-s algorithm

→ ③

34

c) k-NN algorithm:

Input to the algorithm

Output of the algorithm

→ 74

Prediction from the algorithm

74

9) a) Artificial neurons are like biological neurons which are called nodes.

→ ①

Explanation of nodes

→ ①

Neat diagram of a structure of single neuron

→ ②

4M

b) Explanation of mathematical model of biological neuron.

2 steps of biological neuron

Explanation of Net-sum = $\sum_{i=1}^n x_i w_i$

→ ④

$f(x)$ = Activation function(Net-sum)

Diagram of McCulloch & Pitts Neuron Mathematical Model.

→ ④

8M

c)

Steps of Perceptron algorithm.

→ ④

Explanation of perceptron algorithm

→ ④

8M

10)

a) Explanation of

i) Feed forward neural network

ii) Fully connected neural networks

iii) Multi-layer Perceptron

iv) Feedback neural network

→ 10M

b) Radial basis function neural network algorithm

① Forward phase

→ 6M

② Backward Phase

Explanation of Radial basis function neural network



4M

10M