



VIT[®]

Vellore Institute of Technology
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Reg. No. : **21BEC1851**

Final Assessment Test(FAT) - Nov/Dec 2024

Programme	B.Tech.	Semester	Fall Semester 2024-25
Course Code	BECE309L	Faculty Name	Prof. Nitish Katal
Course Title	Artificial Intelligence and Machine Learning	Slot	D1+TD1
		Class Nbr	CH2024250100200
Time	3 hours	Max. Marks	100

General Instructions

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Course Outcomes

- CO1: Comprehend different intelligent agents and its variants.
- CO2. Solve the real-world problem using the various search algorithms.
- CO3. Infuse various symbolic knowledge representation.
- CO4. Employ intelligent agents for decision making.
- CO5. Handle real-time issues using various learning methodologies.
- CO6. Apply deep learning algorithms for solving real-world problems.

Section - I

Answer all Questions (6 × 15 Marks)

***M - Marks**

Q.No	Question	*M	CO	BL
01.	<p>In a treasure-hunting game, the goal is to collect all the treasures scattered across a map while avoiding traps and monsters. The player (agent) can move in four directions (up, down, left, right) and gains points for collecting treasures while losing points or lives if they step into a trap or encounter a monster.</p> <p>a) Explain the difference between a goal-based agent and a learning agent. How do these two types of agents approach decision-making in the treasure-hunting game? [5 Marks]</p> <p>b) Given the following scenarios, compare how a goal-based agent and a learning agent would behave:</p> <p>i. Scenario 1: The agent is close to a treasure but detects a trap nearby. It can either move cautiously to collect the treasure or take a detour to avoid potential danger. [3 Marks]</p> <p>ii. Scenario 2: The agent has multiple paths available to reach distant treasures, but some paths have more traps while others have more treasures. [3 Marks]</p> <p>c) Which agent would perform better in a complex/dynamic environment where the agent needs to adapt to changing conditions, such as moving traps or evolving monster behaviors? Justify the answer based on how each agent processes information, learns from experiences, and makes decisions in the game. [4 Marks]</p>	15	1	1

02.	<p>Arjun wants to develop a route-planning system for a delivery robot navigating a city grid. The robot starts at the top-left corner and must reach the bottom-right corner, avoiding obstacles (blocked cells) and considering conditions like fast roads and high-traffic areas that slow down movement.</p> <p>a) Describe how Breadth-First Search (BFS) and Depth-First Search (DFS) would work on this grid. Explain their expected behavior, strengths, and weaknesses in this scenario.(5 Marks)</p> <p>b) Explain how the A* algorithm could be applied to this problem. Describe a suitable heuristic and discuss its impact on the search's efficiency and accuracy.(5 Marks)</p> <p>c) Compare BFS, DFS, and A* in terms of handling obstacles and varying conditions. Recommend the best search method for the robot and justify your choice.(5 Marks)</p>	15	2	2
03.	<p>You are tasked with designing a knowledge representation system for an autonomous vehicle operating in urban environments. The vehicle must interpret road signs, detect pedestrians, and follow traffic laws to make safe and efficient driving decisions. To enable this, the system will use frames to represent driving scenarios such as intersections and pedestrian crossings, and semantic networks to establish relationships between various road elements, like yield and stop signs, to handle context-dependent actions.</p> <p>a) Describe how frames would be structured to represent specific driving scenarios. Include the types of information stored in frame slots for examples like intersections and pedestrian crossings. (5 marks)</p> <p>b) Explain how a semantic network would facilitate the vehicle's decision-making by establishing relationships between road signs, traffic signals, and pedestrian behavior patterns. (5 marks)</p> <p>c) Identify and discuss the challenges of implementing this knowledge representation system in an autonomous vehicle. How would you address complexities related to different traffic laws, various road types, and unpredictable human behaviors? (5 marks)</p>	15	3	3
04.	<p>You are a financial advisor helping a client decide between two investment options. Investment A has a high probability of moderate returns but a low probability of significant loss, while Investment B has a low probability of high returns and a moderate probability of minor loss. The decision needs to be made under uncertain market conditions, and each option has varying degrees of risk and reward.</p> <p>a) Explain how you would use probability reasoning to help the client make this decision (5 Marks).</p> <p>b) Discuss the following:</p> <p>i. How would simple probability calculations assist in evaluating each investment option's expected return? (3 Marks)</p> <p>ii. What complex probability reasoning might be needed to consider factors like market trends and volatility? (3 Marks)</p> <p>iii. How would you handle uncertainty in the decision-making process, and what techniques could you use to present a clear recommendation to your client? (4 Marks)</p>	15	4	4
05.	<p>Ensemble learning combines the mapping functions learned by different classifiers to generate an aggregated mapping function.</p> <p>Ensemble Learning is a method of reaching a consensus in predictions by fusing the salient properties of two or more models.</p> <p>Justify the above two statements with examples. (7 Marks + 8 Marks)</p>	15	6	3

06. You are tasked with developing a sentiment analysis model to classify customer reviews into positive, negative, or neutral categories. Your dataset contains thousands of reviews, each with a variable number of words. To model this sequence data, you decide to use a sequence-based neural network architecture. 15 6 6
- (a) Explain how a sequence-based neural network can be used for sentiment analysis on this dataset. (5 Marks)
- (b) Discuss the following aspects:
- How does this model handle variable-length sequences of text? (3 Marks)
 - How does the hidden state play a role in classifying the sentiment of each review? (3 Marks)
 - What challenges might you face with vanishing gradients in this type of neural network, and how would you address them? (4 Marks)

Section - II
Answer all Questions (1 × 10 Marks)

Q.No	Question	*M - Marks		
		*M	CO	BL
07.	John is working on a project that aims to predict house prices in a given city. The dataset he has contains various attributes such as the number of bedrooms, size of the house, location, etc. However, the dataset is quite messy, incomplete, and comes from multiple sources. (a) Discuss the importance of data transformation and provide examples of transformations John can apply to the dataset to improve its predictive power. Include at least three transformations and explain their benefits. (5 Marks) (b). With the dataset containing a large number of variables, John is concerned about overfitting and the computational cost of his model. Describe the concept of data reduction and suggest methods John can use to reduce the dimensionality of his dataset. Discuss at least two techniques and their potential impact on the model's performance. (5 Marks)	10	5	3

BL-Bloom's Taxonomy Levels - (1.Remembering, 2.Understanding, 3.Applying, 4.Analysing, 5.Evaluating, 6.Creating)

