VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SLOT: A1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

Programme Name & Branch	: BTECH - Computer Science and Engineering & Business Systems
Course Code and Course Name	: CBS 3004, Artificial Intelligence
Faculty Name(s)	: Prof.Annapurna J
Class Number(s)	: VL2025260103293
Date of Examination	: 17-08-2025
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Course Outcomes:
CO1:Evaluate Artificial Intelligence (AI) methods and describe their foundations.
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.

Q. No	Question	M	CO	BL
1.	An AI agent is deployed for real-time object detection within a dynamic video stream focused on traffic surveillance. The environment comprises a network of roadside or aerial cameras monitoring busy intersections, highways, pedestrian crossings, and urban roadways. The video feed captures a continuous stream of high-resolution frames featuring diverse and rapidly changing elements such as moving vehicles (cars, buses, trucks, bikes), pedestrians, cyclists, traffic signals, and road signs. Environmental conditions vary throughout the day and across seasons, introducing challenges like low light at night, glare during daytime, rain, fog, and shadows. The scene may also include sudden incidents like accidents, traffic congestion, or vehicles violating traffic rules. The AI agent processes each frame in real time to detect, classify, and track multiple objects simultaneously. Various performance metrics such as:Frame Processing Rate (FPS, Mean Average Precision (mAP), Intersection over Union (IoU,Precision and Recall,Latency etc.can be used in multi-object tracking to evaluate how well objects are consistently tracked across frames. These performance indicators ensure that the AI agent delivers robust, accurate, and timely analysis in complex and unpredictable urban traffic environments. The system supports applications like traffic rule enforcement, congestion detection, accident response, and urban planning insights. 1. Describe nature of the task environment for TSA and justify your answer.[4M] 2. Discuss the PEAS for TSA. [4M] 3. Suggest an agent program for TSA and justify your answer.[2M]	10	1	4
2.	Consider a modified water jug problem with three jugs A,B, C . The capacities of the jugs are : A-8L, B-5L and C-3L. A state is defined as a tuple: State S=(a,b,c) . Where: a: amount of water in Jug A ($0 \le a \le 8$) b: amount of water in Jug B ($0 \le b \le 5$) c: amount of water in Jug C ($0 \le c \le 3$).	10	2	4

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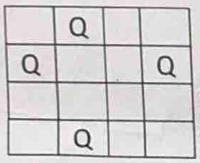
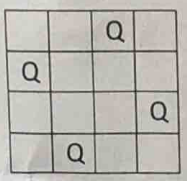
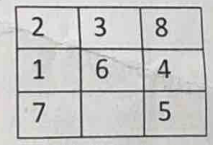
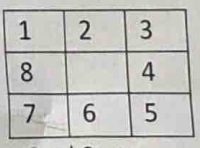
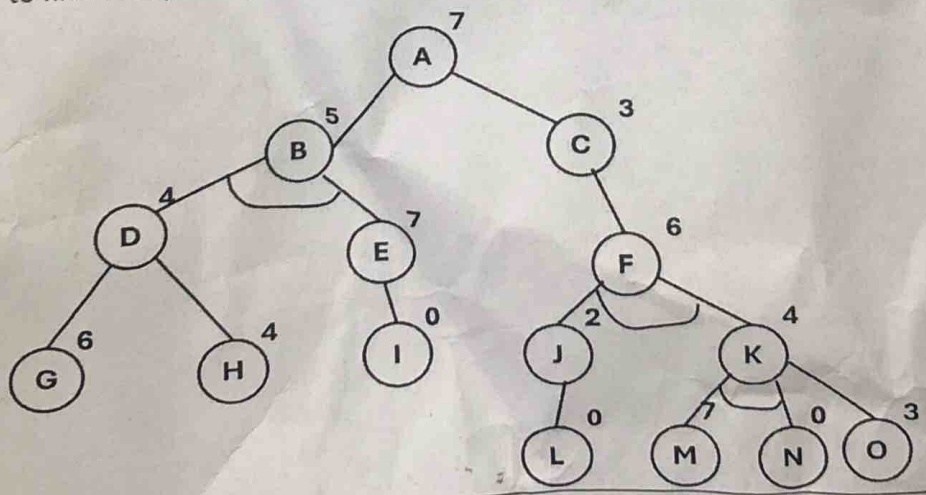
	The goal is to get two jugs with 4L each. Design a production system comprising a well-defined set of rules that guide the agent in solving the water jug problem. Additionally, construct a comprehensive state space graph that visually represents the roadmap of all possible states the agent may encounter while navigating through the problem-solving environment.			
3.	Formally define the 4-Queens problem, specifying the constraints and objectives. Using the given initial and goal states, construct the corresponding state space graph (partial) that represents all possible configurations the agent can explore to reach the solution.  Initial State  Goal State	10	2	4
4.	Given the following initial and goal states of an instance of the 8-puzzle problem, apply both Breadth-First Search (BFS) and Depth-Limited Search (DLS) strategies to compute the path from the initial state to the goal state (Assume the depth limit as 4). Analyse and compare the resulting search paths and associated costs. Do both strategies yield the same solution path and cost? Discuss your observations and insights regarding their performance, efficiency, and suitability for solving this problem.  Initial State  Goal State	10	2	4
5.	Consider the following AND-OR graph. Assume Node-A is the start node, Apply AO* algorithm to find the optimal path.  	10	2	3

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