



VIT

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

REG.NO.: 24MIS0119

SLOT:D1+TD1

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2026-2027

Session: III

Programme Name & Branch	:	MTech(MIS)	
Course Code and Course Name	:	ISWE302L Artificial Intelligence	
Faculty Name(s)	:	Prof's. ANITHA A, NIRMALA.M, SUGANYA D, NIVEDITA S	
Class Number(s)	:	VL2026270101820, 1822, 1831, 1827	
Date of Examination	:	30-SEP-2026	
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)
- CO3. Implement adversarial search and Constraint Satisfaction problem techniques for decision-making on complex problems.
- CO4. Use knowledge representation and reasoning approaches to solve intelligent decision-making problems under uncertainty

problems under uncertainty

Question

M CO BL

Q. No

1.

Following floods and landslides in Nepal, a disaster-response centre uses MCTS to allocate limited forensic resources for DNA identification. At root state S_0 , 10 simulations have been completed:

Action	Description	N	W
A_1	Exhume Body A	4	18
A_2	Exhume Body B	3	9
A_3	Process Sample C using Korea's team	3	21

$$N(S_0) = 10, \quad UCT = Q + c \sqrt{\frac{\ln N(S_0)}{N(S_0, a)}} \quad \text{where } Q = W/N \text{ and } c = \sqrt{2}.$$

(a) Calculate Q and UCT for A_1 , A_2 , and A_3 . Identify the action selected for the 11th simulation. (3 Marks)

(b) The selected action leads to S_1 , with two untried actions:

- B_1 : Retry using Japan's forensic team
- B_2 : Retry using Singapore's forensic team

Which action is expanded? Give a reason based on the MCTS expansion policy. (2 Marks)

(c) For B_1 , assume $P(\text{success}) = 0.6$ and a successful rollout gives reward = +10. State the reward and explain why MCTS uses rollouts instead of only deterministic evaluation. (2 Marks)

(d) Propagate the reward along: (2 Marks)

$$B_1 \rightarrow S_1 \rightarrow A_{\text{selected}} \rightarrow S_0$$

Update N , W for B_1 and the selected action. Recalculate its Q .

(e) With $N(S_0) = 11$, recompute the UCT of the updated action. State whether it remains attractive for the next iteration. (1 Marks)

2.

The UN General Assembly must schedule four delegations — USA (U), Iran (I), Israel (S), and Russia (R) — into four slots {1,2,3,4}.

Subject to:

- All slots must be different.
- $U < I$
- $|S - I| \neq 1$
- $R \in \{2,3,4\}$
- $S \in \{1,2,3\}$

Initial domains:

Variable	Domain
U	{1,2,3,4}
I	{1,2,3,4}
S	{1,2,3}
R	{2,3,4}

a) Formulate the CSP by specifying variables, domains, and constraints. (2)



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	b) Draw the constraint graph. (1) c) Apply AC-3. Show the arcs processed, domain revisions, and final arc-consistent domains. (4) d) Using the final domains, perform backtracking with forward checking in the order $U \rightarrow I \rightarrow S \rightarrow R$. Show domain pruning and obtain one valid schedule. (3)			
3.	At graVITas 2026, Arjun plans to participate in Code2Create, Robowars, and Aerodominator. Let: P: Arjun registers for Code2Create Q: Arjun registers for Robowars R: Arjun registers for Aerodominator S: Arjun qualifies for the Grand Finale Given facts: $P \rightarrow \neg Q$, $Q \vee R$, $\neg Q$, $R \rightarrow S$ (a) Construct the 4-row truth table for $Q \vee R$. State whether it is satisfiable, valid, or unsatisfiable, and list the satisfying assignments. (3 Marks) (b) Using $Q \vee R$, $\neg Q$, $R \rightarrow S$, determine whether S logically follows. Show the steps and name the inference rules used. (3 Marks) (c) Using resolution, add $\neg S$ to the given clauses and derive the empty clause ($\square$). Show all resolution steps. (4 Marks) Clause 1: $Q \vee R$ Clause 2: $\neg Q$ Clause 3: $\neg R \vee S$ Clause 4 (negated conclusion): $\neg S$	10	4	3
4.	Using the domain facts and rules given below (about GPT-6, GPT-5, and Claude), represent the knowledge in First-Order Logic and prove a query by resolution refutation : - GPT-6 is a language model. - Every language model is trained by some organization. - GPT-6 is trained by OpenAI. - Every language model trained by OpenAI is subject to OpenAI's policy. Predicates: $LanguageModel(x)$, $Organization(o)$, $TrainedBy(x,o)$, $OwnedBy(p,o)$, $SubjectTo(x,p)$ Goal: Prove -- $SubjectTo(GPT6,OAIPolicy)$ using resolution refutation. (a) Convert Statements 1, 3, and 4 into clause form. (2) (b) Negate the goal and add it as a clause. Perform resolution, showing the unifier at each step, until the empty clause ($\square$) is obtained. State what this proves. (4) (c) Convert Statement 2 into clause form using Skolemization. State the Skolem function and briefly explain why a function, rather than a constant, is required. (2) (d) Write the final Skolemized clause with the implicit universal quantifier removed. (2)	10	4	3
5.	A robotic warehouse uses the following cryptarithmic equation to represent energy codes for two operations: <pre> MOVE + LOAD ----- ROBOT </pre> Each letter represents a unique digit (0–9). The same letter has the same digit throughout. M, L, and R cannot be zero. Using the CSP approach: (a) Define the variables and domains. (2 Marks) (b) State the all-different, leading-digit, and column-wise carry constraints. (2 Marks) (c) Formulate the problem as a CSP. (1 Mark) (d) Use backtracking with constraint propagation to find a valid digit assignment. Show the major pruning steps. (4 Marks) (e) Verify the solution by substituting the digits into the equation. (1 Mark)	10	3	4

*****All The Best*****