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

Reg. Number:	23BCE1547

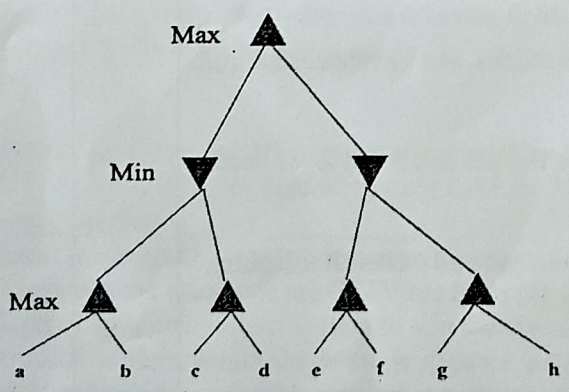
Continuous Assessment Test (CAT) – II OCTOBER 2025

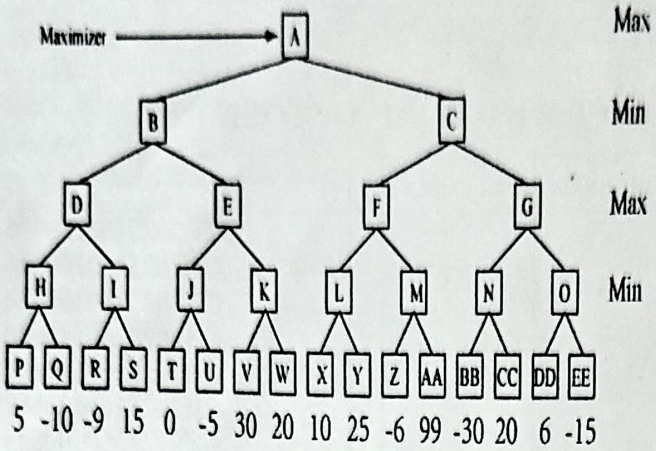
Programme	:	B.Tech(CSE) with all specializations	Semester	:	FALL 2025-26
Course Code & Course Title	:	BCSE306L & Artificial Intelligence	Class Number	:	CH2025260100595 CH2025260100596 CH2025260100597 CH2025260100600 CH2025260100601 CH2025260100602 CH2025260100603 CH2025260100606
Faculty	:	Dr. ABIRAMI S Dr. CHRISTOPHER COLUMBUS Dr. VIJAYAPRABAKARAN K Dr. KAVIPRIYA G Dr. J JOSHAN Dr. RADHIKA SELVAMANI Dr. MODIGARI NARENDRA Dr. D. JEYA MALA	Slot	:	D2+TD2
Duration	:	90 Minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1	A	Consider the below min-max tree, a to h represent numbers on the leaves. You should traverse the left sub-tree before the right sub-tree. Mention the criteria that a to h will hold if no pruning is possible? (4 Marks) 	10	CO2	Apply

	B	 Which move should be made at the top level (Left or Right)? Show the steps of applying the Minimax algorithm by giving the specific value for each node and find the value at root node. (6 Marks)			
2		An intelligent surveillance system is designed to reason about suspicious activities and whether an individual should be flagged in the threat database. It uses the following knowledge base: • Anyone who enters a restricted area without permission is committing a violation. • All violations are recorded and investigated. • Anyone who is investigated and has a prior record is flagged in the threat database. • Alice entered a restricted area. • Alice does not have permission. • Alice has a prior record. • Anyone who has permission is not committing a violation. Use resolution to prove: Alice is flagged in the threat database.	10	CO2	Apply
3	A	Consider a Knowledge Base (KB) defined by the following mathematical equations and constraints involving five variables X, Y, Z, P and Q from a domain U of integers: 1. X+Y= P 2. Y+Z= Q 3. X≥2 Convert the above as Propositional functions and Evaluate the truth value for the following: (i) When X=2, P=10 and Q=12, does the KB entail that Z=8? Justify your answer (2 Mark). (ii) If a new constraint Z≤8 is added, check whether the KB remains consistent (3 Marks)	15	CO2	Apply

	B	An industry wants to provide an AI based Employee Gate Entry System. As per the policy, no one other than the employee can enter into the office. The system gets the images of persons and sends them for processing. If the image has a face mask, by image processing it will remove the mask and get the actual image. The system will have the entire employee images in the backend database. If a person's image is validated, the door will be opened and the person will be allowed to enter. Otherwise, it will raise an alarm and send an sms alert to indicate an unauthorized entry. As per company's policy, if a person has a cough or sneezing, he should wear a face mask. Sam was sneezing so he wore a face mask. When he tried to enter, the system raised the alarm. Prove that "Sam is not an employee" using both forward chaining and backward reasoning in propositional logic.(10 Marks)	5	CO3	Apply
4		At an international athletics competition, an anti-doping system is modeled as a **Bayesian Belief Network (BBN)**. The system considers five factors: **Steroid Use (S):** About **5%** of victorious athletes use steroids. **Medical History (H):** Around **3%** have a condition that raises false positive chances. **Test A (TA):** Depends only on Steroid Use. • If steroids are used → Positive with probability **0.95**. • If not used → False positive with probability **0.02**. **Test B (TB):** Depends on Steroid Use and Medical History. • If S=Yes, H=No → Positive with 0.90. • If S=No, H=No → Positive with 0.05. • If H=Yes → True positive increases by 0.02, false positive increases by 0.10. **Performance (P):** Depends on Steroid Use. • If S=Yes → Unusual performance with 0.80. • If S=No → Unusual performance with 0.10. A. Draw the Bayesian Belief Network with nodes **S, H, TA, TB, P** and write the **full CPTs** for all nodes based on the information given. (3 Marks) B. Explore the importance of Rejection sampling if we have a sample size N of 2,00,000 with accepted samples of 8576 for TA and TB positive. (2 Marks)			
5		The smart home security system is powered by a central power supply, which supports the alarm system, CCTV cameras. The alarm system can be triggered by either motion sensors or window sensors, ensuring that any unusual activity within the home is detected promptly. When the alarm is activated, it sends a signal to the security service for	10	CO3	apply

monitoring. Simultaneously, the CCTV cameras continuously detect activity and can help verify whether a real break-in is occurring. If both the alarm is triggered and the CCTV cameras confirm an intrusion, the security service takes further action by dispatching an emergency response to address the situation.

Motion Sensor (M)	Probability
Triggered	0.05
Not Triggered	0.95

Window Sensor (W)	Probability
Triggered	0.05
Not Triggered	0.95

Power Supply (P)	Probability
Working	0.99
Not working	0.01

CCTV Detection (C)		
P	C=Detect	C=Not Detect
Working	0.90	0.10
Not Working	0.0	1.0

Alarm (A)				
P	M	W	P(A=On)	P(A=Off)
Working	1	1	0.99	0.01
Working	1	0	0.95	0.05
Working	0	1	0.95	0.05
Working	0	0	0.01	0.99
Not Working	1	1	0.0	1.0
Not Working	1	0	0.0	1.0
Not Working	0	1	0.0	1.0
Not Working	0	0	0.0	1.0

Security Service (S)			
A	C	P(S=Yes)	P(S=No)
On	Detect	0.99	0.01
On	Not Detect	0.80	0.20
Off	Detect	0.20	0.80
Off	Not Detect	0.01	0.99

Emergency Response (E)			
A	C	P(E=Yes)	P(E=No)
On	Detect	0.95	0.05
On	Not Detect	0.50	0.50
Off	Detect	0.10	0.90
Off	Not Detect	0.01	0.99

(A) Compute the Probability of security services enabled when Motion Sensor fails (does not trigger when motion occurs), Window Sensors are not Triggered, power supply is working (6 marks)

(B) Calculate the probability of "emergency response dispatched" when motion sensors are triggered, window sensors are off, CCTV is active, and the power supply is working. Assume reasonable conditional probability values. (4 marks)

**********All the best **********

29/9/25