



VIT

Vellore Institute of Technology

REG.NO: 228110024

School of Computer Science Engineering and Information Systems

CONTINUOUS ASSESSMENT TEST - II

FALL SEMESTER 2024-2025

SLOT: D2+TD2

Programme Name & Branch : B.TECH IT
Course Code and Course Name : BITE308L Artificial Intelligence
Faculty Name(s) : HEMALATHA S, SUBHASHINI R, JAYARAM REDDY A
Class Number(s) : VL2024250103401, 3409, 3404
Date of Examination : 16-Oct-2024
Exam Duration : 90 minutes
Maximum Marks: 50

General instruction(s):

Answer All Questions

1. In a knowledge base about animals, consider the following facts and rules:

Facts	Rules
F1: Tweety is a bird.	R1: If an animal has wings and can fly, it is a bird.
F2: Tweety is yellow.	R2: If an animal is yellow and sings, it is likely a canary.
F3: Tweety has wings.	R3: If an animal is a bird and friendly, it is safe to approach.
F4: Birds can fly unless they are penguins or ostriches.	R4: If an animal is a bird and yellow, it could be a canary.
F5: Sam is a canary.	R5: If an animal is a canary, it is small.
F6: All canaries are yellow.	
F7: Canaries are birds.	
F8: Birds have wings.	
F9: Sam sings.	
F10: Birds that sing are considered friendly.	

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a) Generate all possible new facts from the existing ones using **Forward Chaining** approach.

b) Prove that Tweety is small using **Backward Chaining** approach, clearly indicating the sub goals.

2. Consider a **Smart Home Automation System** that manages several key devices: **lights**, a **thermostat**, and a **security camera**. Each device is characterized by specific properties. The **lights** are in different rooms, such as the **Living Room** and **Bedroom**, with each light having a **status** that can be either **on** or **off**, adjustable **brightness** levels (Low, Medium, High), and controlled through various methods like **voice commands**, a **mobile app**, or an automated **schedule**. The **thermostat** monitors the home's temperature, with properties including the **current temperature** (e.g., 22°C), a **desired temperature** that can be adjusted within a range of 16°C to 30°C, and operational modes such as **heating**, **cooling**, or **off**. Additionally, the thermostat tracks **energy efficiency** levels, categorized as **high**, **medium**, or **low**. The **security camera** is installed at strategic locations like the **Front Door** or **Garage**, and has properties such as **status** (either **active** or **inactive**), **recording mode** (which can be **continuous** or based on **motion detection**).

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and storage options for the recorded footage, which can either be stored in the cloud or locally.

Represent this scenario using **frames**. Define the frames for each device and the properties they hold. Additionally, include an **inference mechanism** that can deduce facts about the system's behavior, such as how the system might respond when certain conditions change. For example, what happens when motion is detected at the garage or when the desired temperature is not met. (7+3)

3. Consider the following popular puzzle. When asked for the ages of her three children, Mrs. Baker says that Alice is her youngest child if Bill is not her youngest child, and that Alice is not her youngest child if Carl is not her youngest child. Write down a knowledge base that describes this riddle and the necessary background knowledge that only one of the three children can be her youngest child. Represent this scenario using **propositional logic** and show that **Bill** is her youngest child by applying the **resolution algorithm**. (6+4) 10

4. Convert the given statement into Clause Form, clearly mentioning all steps of Clause Form. 10

$$\forall x(\text{Student}(x) \wedge \text{Smart}(x)) \rightarrow \\ [(\forall y(\text{Teacher}(y) \rightarrow \text{Respects}(x,y))) \vee \\ (\exists z \text{Friend}(z,x) \wedge \text{Helps}(z,x))]$$

5. Given the following statements, represent them in predicate logic and prove whether the conclusion holds using the resolution method. Be sure to convert each sentence to conjunctive normal form (CNF) as part of the proof process. 10

Jack owns a dog. Every dog owner is an animal lover. No animal lover kills an animal. Either Jack or Curiosity killed the cat, who is named Tuna. Did Curiosity kill the cat? (6+4)

