INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

CSE643 – Artificial Intelligence

Monsoon 2021 session

Quiz-1

8-Sept-2021 **Time: 1:30pm to 2:30pm**

Max marks: 10 (will be scaled down to 5 marks)

Deadline to submit your answers: 8-Sept-21 2:30 pm

INSTRUCTIONS: You will have to create a PDF file with your answers, name the file as AI-Q1-<Name>-<RollNo> and upload it on the classroom page. In the answer sheet write your name and roll number. In case you choose to have hand-written answers then those pages can be scanned and uploaded (make sure that it is clearly readable).

Q1: Explain using formal notations what it means for a statement to be valid in propositional logic. (2 marks)

Answer

A statement s in a given knowledge base KB is evaluated in propositional logic to determine its truth value {**T** or **F**}. An interpretation i for propositional logic is a mapping assigning a truth value to each of the simple sentences of the given knowledge base KB. A statement s is satisfied for an interpretation i if and only if for that interpretation i the statement s evaluates as true **T**. A sentence s is *valid* in propositional logic if and only if it is *satisfied* by every interpretation i belonging to the set of all possible interpretations I in a domain D. The interpretations I are a set of possible truth assignments to the propositional variables that represent the given sentences.

Q2: Represent the following in first order predicate calculus. (2 marks)

(i) A student has to do AI course to be an AI-engineer.
(ii) Anyone who likes intelligent behaviour in machines can study AI.
(iii) There are some students in IIITD who understand logic.
(iv) Everyone has some goal in life.

Answer

(i) ∀(x) (Student(x) ^ Do-AI-course(x) → AI-engineer(x)).

(ii) ∀(x) (Person(x) ^ likes-intelligent-behaviour(x) → can-study-AI(x)).

(iii) ∃(x) (Student-In-IIITD(x) ^ understands-logic(x)).

(iv) ∀(x) (Person(x) → (∃(y) goal-in-life(x,y))).

Q3: Represent the following statement in (a) as propositional logic statements and then using clausal form show the logical equivalence with the statement in (b). (2 marks)

a) When a person takes AIcourse then he has fun, or when he takes MLcourse then he has fun.

b) When a person takes AIcourse and MLcourse then he has fun.

Answer

Propositions are:

1) P: Person takes AIcourse
2) Q: Person has fun
3) R: Person takes MLcourse

Statements can be written as:

4) Statement (a) can be written as (P → Q) v (R → Q)
5) Statement (b) can be written as (P ^ R → Q)
6) Proposition in (4) can be written in clausal form as (¬P v Q) v (¬R v Q)
7) Clause in (6) can be written as (¬P v ¬R v Q)
8) Clause in (7) is the logical equivalence of (5) since ≡ (P ^ R → Q)

Thus, we have shown logical equivalence of statement (a) with statement (b).

Q4: An Intelligent Tutoring agent is an agent that can teach a student a topic in a subject and evaluate the student on concepts in that topic by asking questions and evaluating answers. If the student does not understand a concept well then the Intelligent Tutoring agent will identify that part of the concept where the student has trouble and re-teach it in a different way. Describe the PEAS for this agent.

(4 marks)

Answer for Q4

Performance Measure:

1. Topics taught and the time taken to teach
2. Concepts that the student has grasped based on Student's score in test
3. How many concepts were re-taught and student scored better
4. Improvement level of the student's knowledge

Environment:

1. Student's initial knowledge level
2. Tutoring mechanisms and knowledge to be imparted
3. Online/offline, Presentations, Whiteboard
4. Concepts knowledge base

Actuators

1. Display of concepts, Presentations, Audio/Text-to-speech output
2. Video output
3. Suggestions and Hints to student
4. Asking questions on topic
5. Identification and correction of errors

Sensors

1. Keyboard entry
2. Speech based input
3. Screen based writing
4. Student answers to questions posed
5. Video input of student's facial expressions