INDRAPRASTHA INSTITUTE of INFORMATION TECHNOLOGY DELHI

# CSE643 – Artificial Intelligence

## Monsoon 2022 session

## Quiz-1

**20-Sept-2022** **Time: 5:30pm to 6:00pm**

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

**Deadline to submit your answers: 20-Sept-22 6:00 pm**

**INSTRUCTIONS: Handwrite your answers onto your sheets. Then you will have to scan/photo your hand-written answers and upload it on classroom page under your evaluation assignment (make sure that it is clearly readable).**

**Q1:** A particular agent was developed such that it has knowledge base of the world and the effect of its actions, but has a fixed set of actions, and inference algorithms that it uses to infer things of the world.

a) Which kind of agent is this? Justify your answer.
b) Write one line description of other types of agents. (2 marks)

**Answer**

a) It is a model-based agent because it only has fixed, pre-programmed ways to update its model.
b) A learning agent would be able to learn new ways to update its model and its performance measure. A goal-based agent is one that acts to achieve some pre-defined goal. It is usually able to estimate how far away it is from that goal. A utility agent is one that, given a percept sequence, takes the action expected to maximize its performance measure given its knowledge about the world.

**Q2:** Show, using clausal form and truth table, that the biconditional implication A $\longleftrightarrow$ B is true only when A and B have the same truth values. (2 marks)

**Answer**

The biconditional A$\leftrightarrow$B is logically equivalent to (A$\rightarrow$B) and (B$\rightarrow$A).

That is A ◄►B ≡ (A→B) Λ (B→A)**.** We know that the clausal form for (A→B) is (¬A v B). Similarly, the clausal form for (B→A) is (¬B v A). Thus, in truth table form we have the truth values as

| A | B | ¬A | ¬B | ¬AvB | ¬BvA | (¬AvB) Λ (¬BvA) |
|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 |

Thus, we can see that this biconditional statement is true only when A and B have the same truth values.

**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 scientist demonstrates his concepts through experiments then scientist is successful, or when scientist proves his concepts through theory then scientist is successful.
b) When a scientist demonstrates his concepts through experiments and scientist proves his concepts through theory then scientist is successful.

**Answer**

Propositions are:

1) P: scientist demonstrates his concepts through experiments
2) Q: scientist is successful
3) R: scientist proves his concepts through theory

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 Interviewing agent is an agent that can interview a candidate on a topic in a subject and evaluate the candidate on concepts in that topic by asking questions at different difficulty levels and evaluating answers. If the candidate is shaky in a concept then the Intelligent Interviewing agent will identify that part of the concept where the candidate is shaky and ask questions in a different way. Describe the PEAS for this agent. (4 marks)

**Answer**

Performance Measure:

1. Concepts questioned and the time taken to question
2. Evaluation of the answers that the candidate gave
3. How many concepts in which candidate is shaky were identified
4. How many concepts in which candidate is shaky were questioned in a different way

Environment:

1. Candidate's knowledge level
2. Levels of question difficulty
3. Different modes of questioning – objective, short-answers, detailed answers
4. Concepts knowledge base

Actuators

1. Display of questions
2. Audio/Text-to-speech output
3. Video output
4. Marking out errors / Score level

Sensors

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