

THE OPEN UNIVERSITY OF SRI LANKA
 BSc DEGREE PROGRAMME: LEVEL 05
 FINAL EXAMINATION: 2024/2025
CSU5308/CSU5317: ARTIFICIAL INTELLIGENCE



DURATION: TWO HOURS (2 HOURS)

DATE: 11.01.2026

TIME: 2.00 p.m. to 4.00 p.m.
 130 330

Answer FOUR questions ONLY.

Q1.

- (a) Explain the term **Intelligence** and describe how Artificial Intelligence relates to human intelligence.
(3 Marks)
- (b) Describe the **Turing Test**. What are the four main capabilities a computer must possess to pass the Turing Test?
(4 Marks)
- (c) What is meant by the **Cognitive Modeling Approach** in AI? How does it contribute to understanding human thought processes?
(5 Marks)
- (d) Compare **Thinking Rationally** and **Acting Rationally** approaches in AI. Use examples to explain your answer.
(5 Marks)
- (e) List and briefly explain three (03) modern applications or systems of AI.
(8 Marks)

Q2.

- (a) Define **reasoning** and explain what is meant by **premises** and **conclusions** with an example.
(3 Marks)
- (b) Classify and briefly describe the **three main categories of reasoning**. Give one example for each.
(4 Marks)
- (c) Compare and contrast **deductive reasoning** and **inductive reasoning**. Provide one example for each.
(5 Marks)

- (d) Explain **abductive reasoning** with a suitable example. How is it used in real-world problem solving such as medical diagnosis?

(5 Marks)

- (e) List and briefly describe any three (03) **reasoning techniques** used in Artificial Intelligence (**other than deductive, inductive, or abductive**). Include an example for each.

(8 Marks)

Q3.

- (a) Describe the **role of logic** in reasoning. What are the main types of logic used in AI? Briefly explain how can be used these logic?

(3 Marks)

- (b) Define **propositional logic**. Explain the difference between **syntax** and **semantics** in propositional logic.

(4 Marks)

- (c) Write the truth table for the following expression. Explain whether the expression is a **tautology, contradiction, or contingency**.

$$(P \vee Q) \rightarrow (P \wedge Q)$$

(5 Marks)

- (d) Convert the following formula into its **Conjunctive Normal Form (CNF)** step by step.

$$(P \rightarrow Q) \rightarrow \neg R$$

(5 Marks)

- (e) Explain the difference between **propositional logic** and **predicate logic** with examples. Then, express the following sentences using **predicate logic** notation.

(i) "Every student is hardworking."

(ii) "Some cars are not expensive."

(8 Marks)

Q4.

- (a) Define an **intelligent agent**. Explain with examples how human, robotic, and software agents interact with their environments through sensors and actuators. (3 Marks)
- (b) What is an **agent function** and an **agent program**? Explain their relationship using the vacuum cleaner world example. (4 Marks)
- (c) What is meant by the term **rationality** in the context of intelligent agents? List the four (04) factors that rationality depends on. (5 Marks)
- (d) Differentiate between **rational** and **autonomous** agents. Explain how an agent's autonomy improves its performance over time. (5 Marks)
- (e) Explain the roles of information gathering and learning in making an agent more intelligent. Give one real-world example for each concept. (8 Marks)

Q5.

- (a) Define a **task environment** in Artificial Intelligence. Explain the **PEAS representation** and illustrate it with a suitable example. (4 Marks)
- (b) Discuss the main properties used to classify environments:
fully vs. Partially Observable, Deterministic vs. Stochastic, Episodic vs. Sequential, Static vs. Dynamic, Discrete vs. Continuous.
 Provide a brief example for each. (6 Marks)
- (c) List and explain the five (05) types of **agents in AI**. For each type, describe its main feature and give one real-world example. (7 Marks)
- (d) Compare and contrast **Goal-Based Agents** and **Utility-Based Agents**. Explain how a **Learning Agent** enhances these agents' performance over time. (8 Marks)

Q6.

(a) Explain the meaning of the following built-in predicates of Prolog.

- (i) Assert
- (ii) retract
- (iii) setof

(5 Marks)

(b) Create the following Prolog rules.

son/2, daughter/2, mother/2, father/2

(Assume that all these rules have the standard meanings as their names imply.)

(8 Marks)

(c) Consider the following database written in Prolog. How does Prolog answer the queries given in the questions (i) and (ii)?

(Note: Each time that Prolog returns an answer, when the user inputs ; to ask for another answer.)

```
: - dynamic product/4.
product ('P01', 'Processor', 50, 8500).
product ('P02', 'Hard Disk', 50, 4500).
product ('P03', 'Ram', 50, 2500).
product ('P06', 'Monitor', 50, 12000).
product ('P05', 'Printer', 50, 5600).
product ('P04', 'Keyboard', 50, 600).

printList ([]).
printList([H|T]): - product (H, PN, Q, _), write (PN), write ('
'), write(Q), nl, printList(T).

printProList: - setof (PID, PN^Q^UP^product (PID, PN, Q, UP),
L), printList(L).
```

- (i) ? - product (A, B, C, D).
- (ii) ? - printProList.

(12 Marks)

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