National University

Of Computer & Emerging Sciences Faisalabad-Chiniot Campus

AI 2002 Artificial Intelligence

Course Instructor

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Time allowed = 35 min	Quiz 1	Total Marks = 30

BCS Section E

Roll No _____ Name _____ Signature _____

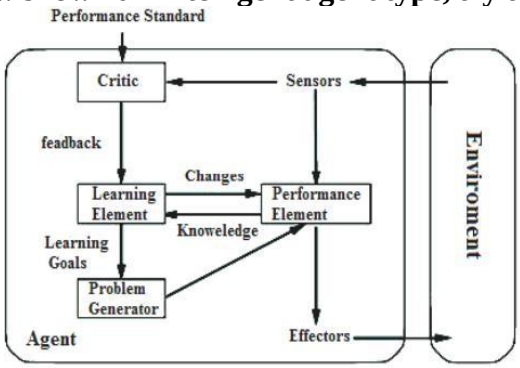
Question No 01: Choose the correct one. **[6]**

1. Consider an AI system designed for real-time stock trading. Which of the following best describes its environment?	**2. You are designing an AI system for medical diagnosis. Which agent type would be most appropriate?**
a) Partially observable, deterministic, static b) Fully observable, deterministic, episodic c) Fully observable, stochastic, discrete d) Partially observable, stochastic, dynamic	a) Model-Based Reflex Agent b) Simple Reflex Agent c) Goal-Based Agent d) Utility-Based Agent
3. Which of the following statements about rational agents is FALSE?	**4. A model-based reflex agent is better than a simple reflex agent because:**
a) A rational agent must always have complete information about the environment. b) A rational agent always makes the best decision based on available knowledge. c) A rational agent maximizes expected performance based on a performance measure. d) Rationality depends on the agent's percept history and available actions.	a) It ignores the previous percepts state to save the memory. b) It updates internal state for changes in the environment. c) It uses deep learning to infer the new knowledge d) It only works in fully observable environments
5. Which of the following environments is considered stochastic?	**6. What is meant by agent's percept sequence?**
a) Chess game b) Rubik's cube puzzle c) Self-driving car d) Crossword puzzle	a) Used to perceive the environment b) Complete history of actuator c) Complete history of perceived things d) None of the mentioned

Question No 02: Complete the following table **[6 Marks]**

PEAS	Medical Diagnosis System	Part Picking Robot
P =Performance Measure	Accuracy of diagnosis, speed, patient satisfaction	Speed, accuracy of picking, efficiency
E =Environment	Patient symptoms, medical history, lab reports	Factory floor, conveyor belt, objects to pick
A =Actuators	Display screen, recommendations to doctors	Robotic arms, grippers, motors
S =Sensors	Patient records, lab results, symptoms database	Cameras, object detection sensors

Question No 03: The figure below shown an intelligent agent type, try to answer the following questions:



a. What is the name of this type of intelligent agent? justify the answer. [1 Mark]

The agent shown in the figure is likely a **Learning Agent**, as it has different components for learning and improving over time.

Justifiation

- The diagram likely includes Performance Element, Learning Element, Critic, and Problem Generator.
- Learning agents improve over time by modifying their internal models.

b. Discuss the function of each part of agent [5 Marks]

Agent Part	Function
Performance Element	Selects external actions based on percepts.
Critic	Evaluates performance and provides feedback.
Problem Generator	Suggests actions for new learning experiences.
Learning Element	Improves agent performance over time.
Sensors	These **perceive information** from the environment.
Effectors	These execute actions based on decisions made by the **performance element**.
Environment	This is the **external world** in which the agent operates.

c. Match the above mentioned of diagram of the agent with their functions. [4 Mark]

Agent Part	Reason	Functionalities
Performance Element	Selects and executes actions based on agent's logic.	Responsible for selecting external actions. In previous parts, this was the entire agent.
Critic	Evaluates agent performance based on predefined criteria.	Gives feedback on how agent is going and determines how performance element should be modified to do better in the future.
Problem Generator	Helps the agent explore new actions to improve performance.	Suggests actions for new and informative experiences
Learning Element	Improves agent capabilities over time using feedback.	Responsible for making improvements (on whatever aspect is being learned)

Question No 04: Describe a real-world application where a utility-based agent is used and explain why it is appropriate for that scenario. [4 Marks]

(Answer bases on the student provided example such as)

A **self-driving car** is a real-world example of a **utility-based agent** because it must **maximize multiple factors** rather than following a fixed set of rules.

Why Utility-Based?

- A **Utility-Based Agent** selects actions that maximize safety and efficiency.
- It evaluates **multiple factors** (speed, fuel efficiency, traffic rules).
- **Utility function** helps in balancing trade-offs (e.g., reaching destination vs. fuel consumption).

By **assigning utilities** to each action, the car **chooses the best course of action dynamically** in different driving conditions.

Question No 05: Suppose you are designing an AI assistant for doctors in a hospital. Which agent type would you choose (simple reflex, model-based, goal-based, or utility-based)? Justify your choice [4 Marks]

A **model-based agent** or a **utility-based agent** is best for an AI medical assistant.

- **Model-Based Agent:** Maintains **internal knowledge** of diseases and treatments, updating its state based on **patient symptoms and medical history**.
- **Utility-Based Agent:** Weighs **treatment success rates, side effects, and urgency** to provide the **best possible recommendation** rather than just following fixed rules.

Justification:

- Medical diagnosis systems require **performance measures (healthy patient, low cost, fast diagnosis)**.
- The AI must **perceive symptoms (sensor: patient data), act (diagnosis/treatment), and adjust based on new data**.
- Unlike simple reflex agents, **it considers past information and optimizes decisions** rather than reacting to single percepts.