Part A : Performance and Utility

1. What is the difference between a performance measure and a utility function?

A performance measure helps distinguish between better and poorer results by assigning a score to an agent's actions based on the outcomes produced. In contrast, a utility function expresses how much satisfaction or happiness an agent derives from different states, capturing its internal preferences. In summary, the utility function represents the agent's personal values, while the performance measure provides an external perspective on success.

2. Describe the relation between the performance measure and the utility function for a learning agent.

The performance measure acts as a feedback system, rewarding or penalizing the agent according to the effectiveness of its actions. The utility function is shaped by this feedback, helping the agent evaluate the merits of various outcomes and make more informed decisions. Together, they create a learning loop in which the agent learns from both successes and failures, adjusting its behavior to better align with its objectives over time.

Part B: Rational Agents

Agent	Performance	Environment	Actuators	Sensors
Playing Monopoly	Increase wealth, Buying more properties, Win the game	Monopoly board with spaces, cards, player pieces, Bank	Game pieces, Cards, dices, Money transfer.	Visual obervation, Player actions, financial resources.
Spear Throwing Athelete	Achieve maximum distance	Field with defined throwing area, weather, audience	Muscles, Body posture, Grip techniquies	Visual (target), proprioceptive, kinesthetic feedback

Agent	Fully Observable vs. Partially Observable	Deterministic vs. Stochastic	Static vs. Dynamic	Discrete vs. Continuous
Playing Monopoly	Partially Observable (Players cannot see opponents' hands or strategies, leading to uncertainty.)	Stochastic (Dice rolls introduce randomness, affecting outcomes unpredictably.)	Static (The game state only changes with player actions, not on its own.)	Discrete (The game consists of distinct turns and actions, making it a series of defined events.)
Spear Throwing Athlete	Partially Observable (Factors like wind and surface conditions are difficult to assess fully before the throw.)	Stochastic (Environmental factors (like wind) can vary, affecting performance unpredictably.)	Statics (athlete's preparation and execution of the throw) Dynamic (Weather condition, second throw)	Continuous (The motion of the throw involves a range of possible angles and speeds, resulting in a smooth transition rather than distinct steps.)