Surprise Test-3

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Branch: BE-CSE (LEET)

Section/Group: 809/A

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Subject Name: Principles of AI

Subject Code: 20CST-258

1. Aim/Overview of the practical:

What do you understand by Reinforcement Learning technique?

2. Theories:

Reinforcement learning is a machine learning training method based on rewarding desired behaviours and/or punishing undesired ones. In general, a reinforcement learning agent is able to perceive and interpret its environment, take actions and learn through trial and error.

In reinforcement learning, developers devise a method of rewarding desired behaviors and punishing negative behaviors. This method assigns positive values to the desired actions to encourage the agent and negative values to undesired behaviors. This programs the agent to seek long-term and maximum overall reward to achieve an optimal solution.

These long-term goals help prevent the agent from stalling on lesser goals. With time, the agent learns to avoid the negative and seek the positive. This learning method has been adopted in artificial intelligence (AI) as a way of directing unsupervised machine learning through rewards and penalties.

Applications and examples of reinforcement learning:

While reinforcement learning has been a topic of much interest in the field of AI, its widespread, real-world adoption and application remain limited. Noting this, however, research papers abound on theoretical applications, and there have been some successful use cases.

Current use cases include, but are not limited to, the following:

- gaming
- resource management
- personalized recommendations
- robotics

Gaming is likely the most common usage field for reinforcement learning. It is capable of achieving superhuman performance in numerous games. A common example involves the game *Pac-Man*.

A learning algorithm playing *Pac-Man* might have the ability to move in one of four possible directions, barring obstruction. From pixel data, an agent might be given a numeric reward for the result of a unit of travel: 0 for empty space, 1 for pellets, 2 for fruit, 3 for power pellets, 4 for ghost post-power pellets, 5 for collecting all pellets and completing a level, and a 5-point deduction for collision with a ghost. The agent starts from randomized play and moves to more sophisticated play, learning the goal of getting all pellets to complete the level. Given time, an agent might even learn tactics like conserving power pellets until needed for self-defense.

Reinforcement learning can operate in a situation as long as a clear reward can be applied. In enterprise resource management (ERM), reinforcement learning algorithms can allocate limited resources to different tasks as long as there is an overall goal it is trying to achieve. A goal in this circumstance would be to save time or conserve resources.

In robotics, reinforcement learning has found its way into limited tests. This type of machine learning can provide robots with the ability to learn tasks a human teacher cannot demonstrate, to adapt a learned skill to a new task or to achieve optimization despite a lack of analytic formulation available.

Reinforcement learning is also used in operations research, information theory, game theory, control theory, simulation-based optimization, multiagent systems, swarm intelligence, statistics and genetic algorithms.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			