UNIT 1: Introduction: Artificial Intelligence for Everyone

D. Short Answer Questions:

1. How is machine learning related to AI?

Ans. Machine learning enables machines to learn, forecast, and improve on their own, contributing to the broader field of AI.

2. Define machine learning.

Ans. Machine learning is defined as the science of getting computers to act without being explicitly programmed, and its primary categories include supervised, unsupervised, and reinforcement learning.

3. What is deep learning, and how does it differ from traditional machine learning?

Ans. Deep learning is a subset of machine learning entirely based on artificial neural networks, distinguished by its ability to solve end-to-end problems and its heavy reliance on high-end machines for computation.

4. What do you mean by Reinforcement Learning? Write any two applications of Reinforcement Learning at School.

Ans. Reinforcement learning is a type of machine learning where an agent learns to make decisions by interacting with an environment and receiving feedback in the form of rewards or penalties. Two applications in schools include adaptive learning systems that personalize content and educational games/simulations that engage students in interactive learning experiences.

5. How do you understand whether a machine/application is AI based or not? Explain with the help of an example.

Ans. To understand whether a machine/application is AI based or not, we need to check if it learns with data and whether it's able to decide/predict.

E. Long Answer Questions:

1. Define Data. List the types of data.

Ans. Data refers to raw facts, figures, or information collected from various sources, which can be processed, analyzed, and used to draw conclusions or make decisions. Data can be in various forms and can be processed by both humans and machines.

Types of Data:

1. Structured Data: Data that is highly organized, following a predefined schema, and stored in a tabular format (e.g., rows and columns in databases).
   Examples: Spreadsheets, databases, names, ages, addresses, sales data.
2. Unstructured Data: Data that does not have a specific format or structure, making it difficult to organize in traditional databases.
   Examples: Text files, videos, audio recordings, social media content, emails, images.
3. Semi-Structured Data: Data that does not conform to a rigid structure but still contains tags or markers to separate elements and enforce hierarchies.
   JSON files, XML files, emails (with headers and body), social media posts with metadata.

2. What is Deep Learning, and How Does It Differ from Traditional Machine Learning?

Deep learning is an AI function that imitates the working of the human brain in processing data and creating patterns for use in decision-making. It is based on artificial neural networks (ANNs) and involves multiple layers of processing to extract features and learn from large datasets. Deep learning can handle complex data such as images, audio, and unstructured text, allowing for end-to-end learning without the need for manual feature extraction.

Differences Between Deep Learning and Traditional Machine Learning:

Feature	Traditional Machine Learning	Deep Learning
Dataset Size	Works well with small datasets	Requires large datasets
Computational Power	Can run on low-end machines	Heavily dependent on high-end machines (GPUs/TPUs)
Approach	Divides tasks into sub-tasks and combines results	Solves problems end-to-end
Training Time	Takes less time to train	Takes longer to train
Testing Time	May increase testing time	Generally faster testing once trained

In traditional machine learning, models often rely on manual feature extraction, where human experts define which features of the data are important for the model to learn. In contrast, deep learning models automatically learn these features through layered neural networks, which makes them particularly effective for complex data types such as images and natural language

F. Case-study/Application Oriented Questions:

A hospital implemented an AI system to assist doctors in diagnosing diseases based on medical images such as X-rays and MRI scans. However, some patients expressed concerns about the accuracy and reliability of the AI diagnoses. How can the hospital address these concerns?

Ans. The hospital can address these concerns by conducting thorough validation studies to assess the accuracy and reliability of the AI system compared to human diagnoses. They can also ensure transparency by providing detailed information about how the AI system works and how it complements the expertise of human doctors.

G. Competency Based Questions

1.Rahul is an architect. He has designed and built a beautiful home for his client in Pune. He has installed these systems/appliances/gadgets at the newly constructed home. Identify which of these are AI systems and which of these are not AI systems.

Solar water heater, Smart TV, Security cameras, rainwater harvesting system, cleaning robots, smart lighting, automatic door, Siri, automatic washing machine.

After separating the AI systems, mention some parameters on which you choose these appliances/systems as AI systems.

Ans: The AI systems are: Smart TV, cleaning robots, smart lighting, Siri.

The systems which are not AI systems are: Solar water heater, security cameras, rainwater harvesting systems, automatic door, automatic washing machine.

The parameters are: ability to make decisions, problem-solving, recommendations, adapt to new situations, and learn from past experiences. (any other AI feature can be included).

2.If you were designing a robot to sort recyclable items like glass, plastic, and paper, which type of learning would be used to help the robot.
Ans: Supervised learning

3.Can you think of a scenario where you have a bunch of different fruits mixed together and you want the computer to organize them into groups based on similarities?
Ans: Unsupervised learning

4.Mr. Shankar owns a company that deals with services to customers related to financial investments. Lately, he has been using AI technology in his company due to which his employees are facing less job responsibility, customers are feeling insecure about their data. What is this scenario known as?
Ans: Potential impact of AI on society

5.Jatin is a student who has just enrolled in a course in AI. He attended a few introductory classes and learned that systems can learn from the data using algorithms to perform a task without explicitly programming it. In some situations, the system mimics the human brain's learning process. Identify the concepts in this scenario.
Ans: Machine learning and Deep learning

ANSWERS

A. Multiple-choice questions (MCQs):

1. b. John McCarthy 2. b. 1955 3. a. Data is as valuable as oil
4. b. Hidden layer 5. c. Supervised Learning 6. b. Artificial Neural Networks
7. c. Rewarding desired behaviors and/or penalizing undesirable ones
8. a. Gmail

B. Fill in the Blanks:

1. human-like 2. Humans 3. Machine Learning 4. Deep Learning 5. Secure

C. True or False:

1. True 2. False 3. False 4. False 5. False