We need to describe the PEAS for the “bidding on an item at an auction” activity. PEAS stands for **Performance measures, Environment, Actuators, and Sensors**. We shall see what these terms mean individually.

- **Performance measures:** These are the parameters used to measure the performance of the agent. How well the agent is carrying out a particular assigned task.
- **Environment:** It is the task environment of the agent. The agent interacts with its environment. It takes perceptual input from the environment and acts on the environment using actuators.
- **Actuators:** These are the means of performing calculated actions on the environment. For a human agent; hands and legs are the actuators.
- **Sensors:** These are the means of taking the input from the environment. For a human agent; ears, eyes, and nose are the sensors.

Let us come back to the auction activity.

Performance measures:

1. Cost of the item
2. Quality of the item
3. Value of the item
4. Necessity of the item

Environment:

1. Auctioneer
2. Bidders
3. BiddersItems which are to be bid

Actuators: (means to perform the activity)

1. Speakers

2. Microphones
3. Display items
4. Budget

Sensors: (means to perceive the environment)

1. Camera
2. Price monitor, where prices are being displayed.
3. Eyes
4. Ears of the attendees.

Further, we shall see the properties of this agent.

1. **Observable (Fully/Partially):** It is a partially observable environment. When an agent can't determine the complete state of the environment at all points of time, then it is called a partially observable environment. Here, the auctioneering agent is not capable of knowing the state of the environment fully at all points in time. Simply, we can say that wherever the agent has to deal with humans in the task environment, it can't observe the state fully.
2. **Agents (Single/Multi):** It is single-agent activity. Because only one agent is involved in this environment and is operating by itself. There are other human agents involved in the activity but they all are passing their percept sequence to the central agent – our auction agent. So, it is still a single-agent environment.
3. **Deterministic (Deterministic/Stochastic):** It is stochastic activity. Because in bidding the outcome can't be determined base on a specific state of the agent. It is the process where the outcome involves some randomness and has some uncertainty
4. **Episodic (Episodic/Sequential):** It is a sequential task environment. In the episodic environment, the episodes are independent of each other. The action performed in one episode doesn't affect subsequent episodes. Here in auction activity, if one bidder set the value X then the next bidder can't set the lesser value than X. So, the episodes are not independent here. Therefore, it is a sequential activity. There is high uncertainty in the environment.
5. **Static (Static/Semi/Dynamic):** It is a dynamic activity. The static activity is the one in which one particular state of the environment doesn't change over time. But here in the auction activity, the states are highly subjective to the change. A static environment is the crossword solving problem where numbers don't change.
6. **Discrete (Discrete/Continuous):** It is a continuous activity. The discrete environment is one that has a finite number of states. But here in auction activity, bidders can set the value forever. The number of states can be 1 or 1000. There is randomness in the environment. Thus, it is a continuous environment.

2. PEAS description of the “online shopping agent”

We need to describe the PEAS for the “shopping for DataWarehousing books on the internet” activity.

Performance measures:

- Price of the book
- Author of the book
- Quality of the book
- Book reviews on google.
- Obtain interested/desired books.
- Cost minimization.

Environment:

- Internet websites.
- Web pages of a particular website
- Vendors/Sellers
- Shippers

Actuators:

- Filling in the forms.
- Display to the user
- Follow URL

Sensors:

- Keyboard entry
- Browser used to find web pages
- HTML

Further, we shall see the properties of this agent.

1. Observable (Fully or Partial): This environment is partially observable. When an agent can’t determine the complete state of the environment at all points of time, then it is called a partially observable environment.

Here, the shopping agent can’t see all types of books on one webpage. For example, on the current webpage, all the books have similar ratings and prices. If the user wants to see the books with high ratings then the agent has to follow a different webpage or set the

filter in the search bar. Thus, the agent is interacting with a partially observable environment.

2. Deterministic or non-deterministic: The environment is deterministic. A task environment is said to be deterministic if the current state and actions performed in the current state completely determines the next state, otherwise, it will be a non-deterministic task environment.

Here, if the shopping agent likes a book and wants to purchase it, then the next state will be followed for the same book. The next stages will be: payment, filling in the delivery address, and order confirmation. The agent will make the payment for the selected book only. Thus, the next state is determined by the current state.

3. Episodic/Sequential: This is a sequential environment. An environment is said to be episodic if it consists of independent episodes and actions performed in one episode don't affect the other episodes. In a sequential environment, the actions performed in the current state will affect the next states.

Here, if the current book is rejected by the agent then the agent will not see the same book again. The webpage will not show the same book again, once it is rejected by the agent. Therefore, the action in the current state completely changed the next possible state.

4. Static/Dynamic: It is a static environment. An environment is static if it does not change over time. A car driving environment is dynamic because vehicles are running continuously. The agent doesn't know what is going to come next. But in the static environment, a particular state is completely unchangeable over time, like a web page.

Here, the details of the books or the list of the books displayed on the website is not going to change over time. Details of the book don't depend on the actions of the agent.

5. Discrete/Continuous: It is a discrete environment. An environment is discrete if it consists of a finite number of states. A chess-playing environment is discrete while the car driving environment is continuous.

Here, the number of states is finite. The possible states are:

- See the book details
- See the price
- Fill the form
- Place the order and make payment.

6. Single-agent/Multi-agent: It is a single-agent system. Only one agent is interacting with the environment and no other robots or AI agent is present in the environment. An environment is said to be a single agent environment if only one agent is interacting and acting on it, otherwise multi-agent. A chess-playing environment is multi-agent since two agents (human or robot) are required to play the chess game.

Here, the shopping agent alone is acting on the website.