

# CLASS 4

## **Demand for Inventory Items:**

To develop an optimal inventory policy for any inventory item, it is essential to understand the nature of demand (i.e. both its size and pattern) for that inventory item. The *size of demand* refers to the number of units of the item required in each period (cycle or season). The size is not measured in terms of the number of units sold because the demand may remain unfulfilled due to shortage of stock or due to delay in delivery. The size of demand may be either deterministic or probabilistic. In the deterministic case, the demand over a period of time is known with certainty. But, in the probabilistic case, the demand over a period of time is not known with certainty. The nature of such demand can be described by a known probability distribution. The *pattern of demand* is the manner in which inventory items are required by the customers. The demand for a given period of time may be satisfied instantaneously at the beginning of the period, or uniformly during that period. The effect of both instantaneous and uniform demand causes variation in the total inventory cost.

## **Replenishment Lead Time:**

**Order cycle:** The order cycle is the time period between two successive replenishments. As discussed earlier in this section, it may be determined in one of the following two ways:

- *Continuous Review:* In this case, the number of units of an item on hand are known and an order of fixed size is placed every time the inventory level reaches at a pre-specified level, called *order point* or *reorder level*. This decision rule is also referred to as the *two-bin system*, *fixed order size system* or *Q-system*.
- *Periodic Review:* In this case the orders are placed at equal intervals of time, but the size of the order may vary depending on the inventory on hand as well as on order at the time of the review. This decision rule is also referred to as *the fixed order interval system* or *P-system*.

**Lead time or (delivery lag):** The delivery of the items ordered may not reach instantaneously (immediately). The time delay between placing an order and receipt of delivery is called *delivery lag* or *lead time*. In general, the lead time may be deterministic or probabilistic.

**Stock replenishment:** The replenishment of stock may occur instantaneously or gradually. Instantaneous replenishment is possible when the stock is purchased from outside sources, while gradual replenishment is possible due to a finite production rate within the firm.

**Planning Period:**

The time period for which a particular inventory level is maintained is called planning period. This period may be finite or infinite depending on the nature of the demand.

**INVENTORY MODEL BUILDING:**

An inventory control problem can be solved by using several methods, starting from trial-and-error methods to mathematical and simulation models. Mathematical models help in deriving certain rules that may suggest how to minimize the total (or incremental) inventory cost when demand is either deterministic or probabilistic.

**Steps of Inventory Model Building:**

The steps to develop a deterministic inventory model are summarized as follows:

**Step 1:** Collect the data regarding the pattern of demand, the replenishment policy, planning period, relevant inventory costs, etc.

**Step 2:** Define an appropriate relationships (i.e., mathematical model) among various factors obtained in

Step 1 to know the features of the existing inventory system. The model so developed may either be an unconstrained or constrained optimization model, depending upon whether the constraints on limited resources (such as floor space for storage, capital investment, etc.) are imposed or not.

**Step 3:** Derive an optimal inventory policy (i.e. economic order quantity) by using an appropriate solution procedure so as to maintain balance amongst the inventory costs.