📘 CHAPTER 4: DEMAND ANALYSIS – FULL SUMMARY

I. UTILITY THEORY

🔹 **Key Concepts:**

- **Utility**: Satisfaction derived from consuming goods/services.
- **Nonsatiation Principle**: More is always better.
- **Ordinal vs. Cardinal Utility**:
  - *Ordinal*: Rank preferences (not measurable).
  - *Cardinal*: Measure utility with units (utils).
- **Utility Function**: Relationship between consumption and utility.
- **Marginal Utility (MU)**: Extra utility from one more unit of a good.

📉 **Law of Diminishing Marginal Utility:**

- As more of a good is consumed, MU decreases.
- Formula:
  $MU = \frac{\Delta U}{\Delta Q}$

II. INDIFFERENCE CURVES

🔹 **Characteristics:**

- Show combinations of goods yielding equal utility.
- **Higher curves = higher utility.**
- **Downward sloping**: More of one good requires less of the other.
- **Do not intersect.**
- **Concave to origin** (diminishing MRS).

🔹 **Types of Goods:**

- **Perfect Substitutes**: Constant MRS (e.g., Coke vs. Pepsi).
- **Perfect Complements**: Consumed in fixed ratio (e.g., car & tire).

III. BUDGET CONSTRAINTS

- **Characteristics:**
- Shows all combinations of goods affordable at given income & prices.
- **Slope**:
  $-\frac{P_X}{P_Y}$
- **Effects:**
- **Income** ↑ → parallel outward shift.
- **Price change** → change in slope.
- **Effects on Consumption:**
- **Income Effect**: Changes overall consumption due to real income.
- **Substitution Effect**: Changes consumption due to price relative changes.

IV. INDIVIDUAL DEMAND

- **Curves:**
- **Price-Consumption Curve**: Effect of price change for one good.
- **Income-Consumption Curve**: Effect of income change on demand.
- **Engel Curve**: Plots income vs. quantity demanded.
- **Good Types:**
- **Normal Goods**: Demand ↑ when income ↑.
- **Inferior Goods**: Demand ↓ when income ↑ (rare).

V. OPTIMAL CONSUMPTION

- **Marginal Rate of Substitution (MRS):**
- Formula:
  $MRS_{XY} = -\frac{MU_X}{MU_Y}$
- **Condition for Utility Maximization**:
  $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$

VI. ELASTICITY ANALYSIS

- **Definitions:**
  - Measures sensitivity of demand to changes in price, income, or other goods' prices.

VII. PRICE ELASTICITY OF DEMAND

- **Formulas:**
  - **Point Elasticity**:
    $\varepsilon_P = \frac{\partial Q/Q}{\partial P/P}$
  - **Arc Elasticity** (large changes):

$$E_X = \frac{Q_2 - Q_1}{Q_2 + Q_1} \div \frac{P_2 - P_1}{P_2 + P_1}$$

- **Total Revenue Rule:**
  - If $|\varepsilon_P| > 1$ → elastic → revenue ↑ when price ↓
  - If $|\varepsilon_P| = 1$ → unit elastic → revenue unchanged
  - If $|\varepsilon_P| < 1$ → inelastic → revenue ↓ when price ↓

VIII. PRICE ELASTICITY & MARGINAL REVENUE

- **Relationship:**
  - MR > 0 → $|\varepsilon_P| > 1$
  - MR = 0 → $|\varepsilon_P| = 1$
  - MR < 0 → $|\varepsilon_P| < 1$
- **Formula:**
  - $MR = P \times \left(1 + \frac{1}{\varepsilon_P}\right)$

IX. OPTIMAL PRICING POLICY

- **Formula:**
- Optimal Price:

$$P^* = \frac{MC}{1 + \frac{1}{\varepsilon_P}}$$

- **Implications:**
- **Essential goods** → inelastic demand
- **Luxury/non-essential goods** → elastic demand

X. CROSS-PRICE ELASTICITY

- **Formula:**

$$\varepsilon_{PX} = \frac{\partial Q_Y / Q_Y}{\partial P_X / P_X}$$

- **Interpretation:**
- $\varepsilon_{PX} > 0$: **Substitutes** (e.g., Coke vs. Pepsi)
- $\varepsilon_{PX} < 0$: **Complements** (e.g., cars & gas)
- $\varepsilon_{PX} = 0$: **Independent goods**

XI. INCOME ELASTICITY OF DEMAND

- **Formula:**

$$\varepsilon_I = \frac{\partial Q / Q}{\partial I / I}$$

- **Categories:**
- $\varepsilon_I > 1$: Cyclical Normal Goods (luxury: housing)
- $0 < \varepsilon_I < 1$: Noncyclical Normal Goods (necessities: candy)
- $\varepsilon_I < 0$: Inferior Goods (very rare)

🧮 EXAMPLE EQUATIONS FROM SLIDES:

- **Linear Demand Example:**
  - $P = 14.3–0.05Q$
  - $Q = 286–20P$