PART-A

UNIT – I: INTRODUCTION

CHAPTER-1

INTRODUCTION

Topic-1 An Introduction to Economics

Revision Notes

- **Wealth Oriented Definition:** According to Adam Smith, "Economics is an enquiry into the factors that determine the wealth of a country and its growth".
- **Material Welfare Oriented Definition:** According to Marshall, "Economics is a study of mankind in the ordinary business of life. It examines that part of individual as social actions, which is most closely connected with the attainment and the use of material requisites of well-being".
- **Scarcity Oriented Definition:** According to Robbins, "Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses."
- **Growth Oriented Definition:** According to Samuelson, "Economics is a social science concerned chiefly with the way society chooses to employ its resources, which have alternative uses, to produce goods and services for present and future consumption."

➢ **Significance of Economics: (i)** For consumers, **(ii)** For producers, **(iii)** For workers, **(iv)** For price determination, and **(v)** For solving the distribution problems.

➢ **Micro Economics:** It studies the economic behaviour of individual economic units and individual economic variables.

➢ **Macro Economics:** It deals with the functioning of the economy as a whole.

Topic-2 Statistics for Economics

Revision Notes

➢ **Statistics:** Word statistics is used in two sense:
- In plural sense, and
- In singular sense.

➢ **Statistics in Plural Sense:** In the plural sense, statistics refers to quantitative data which are collected systematically.

➢ **Statistics in Singular sense:** In the singular sense, statistics means science of statistics or statistical methods. It refers to techniques or methods relating to collection, classification, presentation, analysis and with interpretation of quantitative data.

➢ **Characteristics/Special features of statistics (in plural sense):**
- Aggregate of facts
- Numerically expressed, enumerated or estimated
- Affected to a marked extent by multiplicity of causes

- Reasonable standards of accuracy
- For a pre-determined purpose
- Placed in relation to each other
- Collected in a systematic manner

➢ **Characteristics of Statistics (in singular sense)**:
- Collection of data
- Classification of data
- Tabulation of data
- Presentation of data
- Analysis and interpretation of data.

➢ **Functions of Statistics:**
- To simplify complex facts
- Comparison of facts
- Establishment of relationship
- To enlarge individual knowledge and experience
- To formulate policies in different fields
- To measure the effects
- To test a hypothesis
- Forecasting

➢ **Nature of Statistics:** It is a science as well as an art. As an art, it signifies methods of doing the task and as a science it signifies scientific methods and how to apply those methods.

➢ **Importance of Statistics in Economics:** Production, Consumption, Exchange, Distribution and Economic planning.

➢ **Limitations of Statistics:**
- Statistical results may be non-uniform
- Statistical methods are not applicable to qualitative studies
- Statistical laws are mostly dependent on average which may give false results
- Jurisdiction of statistics cannot be reduced to individuals
- Statistical results cannot always be treated as the pole determinant of the value of a group
- All statistical methods are subject to bias, Exploitation of the innocent
- Statistical law is not correct in the short period.

➢ **Distrust of Statistics:** It can prove anything. Statistics is not bad, it is its misuse which may be bad.

Key Terms

➢ **Economy:** Economy is the system of earning livelihood.

➢ **Consumer:** Who consumes goods and services for the satisfaction of wants.

➢ **Consumption:** The process of using up utility, goods and services for the direct-satisfaction of wants.

➢ **Producer:** Who produces or sells goods and services for the generation of income.

➢ **Production:** The process of creation of utility.

➢ **Saving:** Residual of income after consumption.

➢ **Investment:** It is an expenditure by the producer on the purchase of such assets which help to generate income.

➢ **Economic Activity:** Activities performed by different types of people to earn their living.

➢ **Non-Economic Activity:** Activities which are not concerned with creation of money or wealth are known as Non-Economic Activity.

➢ **Micro Economics:** It studies the economic behaviour of individual economic units and individual economic variables.

➢ **Macro Economics:** It deals with the functioning of the economy as a whole.

➢ **Statistics:** Statistics presents economic facts in a precise manner and draw conclusions from them.

UNIT – II: COLLECTION, ORGANISATION AND PRESENTATION OF DATA

CHAPTER-2
COLLECTION, ORGANISATION AND PRESENTATION OF DATA

Topic-1 Collection of Data

Revision Notes

- **Planning for collection of statistical data:** (1) Objective and scope of statistical investigation, (2) Sources of information, (3) Time and type of statistical enquiry, (4) Determination of statistical tools, (5) Degree of accuracy.
- **Sources of data:** Two: (1) **Internal** and (2) **External.** External can be further divided into Primary data and Secondary data.
- **Difference between Primary and Secondary data:** On the basis of (1) Meaning, (2) Source, (3) Originality, (4) Cost, (5) Availability and (6) Adjustment.
- **Method of collection of Primary Data:** (1) Direct personal observation, (2) Indirect oral investigation, (3) Telephone interview, (4) Information from local correspondents, (5) Mailed questionnaires, (6) Questionnaires filled by enumerators.
- **Selection of Appropriate Method:** (1) The nature of investigation (2) Object and scope of enquiry, (3) Financial resources, (4) Degree of accuracy desired and (5) Time factor.
- **Difference between Schedule and Questionnaire:** On the basis of (1) Responsibility of completing, (2) Medium of information (3) Area of Investigation.
- **Qualities of a Good Questionnaire:** (1) The questionnaire should be brief, (2) Simple, clear and unambiguous questions, (3) Nature of question, (4) Use of proper words in the questions, (5) The question should be such as the answers of which are known to informant, (6) Questions capable of objective answers, (7) Should not affect price or sentiments, (8) Some kind of questions should be avoided, (9) Sequence of the questions, (10) Instructions for filling in the questionnaire (11) Setting of the questionnaire, (12) To test the accuracy, and (13) Pilot survey.
- **Collection of Secondary Data:** (a) Published and (b) Unpublished
  - **Published Sources of Data:** (1) Publication of International bodies, (2) Govt. publications, (3) Report of committees and commissions, (4) Publications and reports of trade Associations and Chamber of Commerce (5) Semi-government publications, (6) Private publications.
  - **Unpublished Sources of Data**
- **Reliability of Secondary Data:** (1) Whether the data are reliable, (2) Whether data are suitable for the purpose, (3) Whether the data are adequate.
- **Important Sources of Secondary Data in India**
  - **Census of India:** It provides most complete and continuous demographic record of population. The first census after independence was held in 1951.
  - **National Sample Survey Organisation (NSSO):** It was established by the government of India to conduct nation-wide surveys on socio-economic issues.

Topic-2 Techniques of Data Collection: Census and Sample Investigation

Revision Notes

- When all the units of investigation are taken into account, it is called census method. On the contrary, when some representative units are selected from the universe and analysed and the conclusions are drawn about universe, it is called sample survey.
- **Census Survey:** Census investigation or complete count, in which information is collected about every unit of the universe relating to the problem under investigation.
- **Advantages of Census Investigation:** (1) More accurate and reliable, (2) Intensive study, (3) Suitability.
- **Demerits of Census Investigation:** (1) Costly method, (2) Requires more labour and time, (3) Not possible in some circumstances.
- **Merits of Sample Investigation:** (1) Reduced cost, (2) Greater speed, (3) Greater scope, (4) Greater accuracy, (5) Detailed enquiry, (6) Administrative convenience, (7) It is the only method in many cases.
- **Demerits of Sample Investigation:** (1) Illusionary conclusions, (2) Representative sample, (3) Specialized knowledge required, (4) It is difficult to restrict the study upto the sample, (5) Impossibility to frame a sample.
- **Essentials of sampling:** (1) Representativeness, (2) Independence, (3) Homogeneity, (4) Adequacy, (5) Similar regulating conditions.
- **Methods of Sampling:**
  - Random sampling method
  - Purposive or Deliberate sampling method
  - Mixed or stratified random sampling method
  - Systematic random sampling method
  - Multi-stage area random sampling method
  - Extensive sampling method
  - Multi-stage sampling method
  - Quote sampling method
  - Convenience sampling method
- **Principles of sampling:** (1) Law of statistical regularity, (2) Law of inertia of large numbers.

Topic-3 Organisation of Data

- **Objectives of Classification:** (i) To bring out points of similarities and dissimilarities, (ii) To reduce complexity, (iii) To facilitate comparison, (iv) To arrange scientifically, (v) To make simple and brief, (vi) To provide base for analysis,
- **Characteristics of Good Classification:** (i) Exhaustive, (ii) Mutually exclusive, (iii) Stability, (iv) Flexibility, (v) Homogeneity, (vi) Suitability, (vii) Arithmetical Accuracy
- **Methods or Types or Basis of Classification:** (i) Geographical, (ii) Chronological, (iii) Attributes: (a) Simple and (b) Manifold, (iv) Numerical classification.
- **Kinds of variable:** (i) Discrete variable and (ii) Continuous variable.
  - **Discrete variable:** Discrete variables refer to those variables which are exact, finite, and are not expressed in fractions.
  - **Continuous variable:** Continuous variable are those variables which can be of any partial value, within the range.
- Statistical series based on quantitative values are of two types: (1) Individual series, (2) Frequency distribution series.
  - **Individual series:** Series of individual observation is a series where items are listed singly as observation, as distinguished from listing them in group.
  - **Frequency distribution series:** Mainly of two types: (a) Univariate frequency distribution and (b) Bivariate frequency distribution.

- **Univariate frequency distribution:** It is made up of one variable only.
- **Bivariate frequency distribution:** In this distribution, two variables are studied at a time.

➢ **Univariate frequency distribution can be of two types**: (1) Discrete and (2) Continuous series.
- **Discrete Series:** In a discrete series, the data are presented in such a way that exact measurements of units are clearly indicated.
- **Continuous Series:** Continuous series is one where measurements are only approximations and are expressed in class interval, i.e., within certain limits.

➢ **Terminology used in classification according to class-intervals:**
- **Class-interval:** In grouped frequency distribution the values of items are shown between two limits. These are called group or class-interval.
- **Class-limit:** Limits between which the observations lie.
- **Magnitude of class-intervals or class-width:** The difference between upper and lower limits of a class is called the magnitude of the class.
- **Mid-value, Mid-point, Central Size or Central Point:** The central point of a class interval is called mid-value or mid-point.
- **Class-frequency:** Number of observations falling within a particular class-interval is called frequency.
- **Frequency-Density:** Per unit average frequency of class-interval is known as frequency density.
- **Range:** The difference between the lower limit of the first class-interval and the upper limit of the last class interval.

➢ **Methods for formation of class-intervals:**
- **Exclusive Method:** Observations of the upper limit of each class interval are not included in that class. 0-10, 10-20 and so on.
- **Inclusive Method:** In inclusive series, both the lower limit and upper limit of a class-interval are included in that class itself. 0-9, 10-19, & so on.

➢ **Change of Inclusive Class-intervals into Exclusive Class Intervals:** Half the difference between upper limit of one group minus lower limit of next group. This half is added to upper limit of the group and subtracted from the lower limit of the next group.

➢ **Cumulative Frequency Distribution:** It is constructed by adding the frequencies of the first class-interval to the frequencies of second class-internal. This total is added to frequencies of third class-interval and so on. Thus it is the running total of all values. It is of two types:
- **"Less than" cumulative frequency distribution:** A downward cumulation results in a list presenting the number of frequency "less than" any given value as revealed by the lower limit of succeeding class-interval.
- **"More than" cumulative frequency distribution:** An upward cumulation results in a list presenting the number of frequencies "more than" any given value as revealed by the upper limit of the preceding class interval.

➢ **Relative Frequency Distribution:** If actual frequencies are expressed as a percentage of the total number of observations, relative frequencies are obtained.

Topic-4 Presentation of Data: Tabular Presentation

Revision Notes

➢ **Objectives of Tabulation:** (i) To clarify the object of investigation, (ii) To clarify the characteristics of data, (iii) To present the data in the minimum space, (iv) To facilitate statistical process, (v) To find out errors in collection of data.

➢ **Advantages of Tabulation:** (i) It simplifies facts, (ii) Economy, (iii) Attractive presentation, (iv) Other benefits.

➢ **Main parts of a Table:** Table number, heading or title, captions, stubs, main body of the table, ruling and spacing, foot-notes, arrangements or adjustment of items, source of data, averages and totals, unit of measurement.

➢ **Types of Table:** (a) On the basis of purpose: (i) General purpose, and (ii) Special purpose, (b) On the basis of originality: (i) Original table, (ii) Derived table (c) On the basis of construction (i) Simple and (ii) Complex table: (a) Two way table, (b) Many fold table.

➢ **General Rules for Tabulation:** Proper demonstration of main points of body, according to objective, manageable, Approximation and unit, and other laws.

➢ **Essentials of a Good table:** (i) Attractive, (ii) Manageable size (iii) Comparable, (iv) According to objective (v) Scientifically prepared, and (vi) Clarity.

Topic-5 Diagrammatic Presentation of Data: Bar Diagrams and Pie Diagrams

Revision Notes

- **Diagrammatic presentation of Data:** Diagrammatic Presentation is a way of presenting the data visually so as to bring out the salient features of the data
- **Advantages of Diagrams:** (1) Attractive and impressive, (2) Make data simple and intelligible, (3) Comparative study, (4) Saving of time and money, (5) Universal utility, (6) Helpful in forecasting.
- **Limitations of Diagrammatic Presentation:** (1) Quantitative Presentation not possible, (2) Not possible to represent small differences in value, (3) Not possible to represent manifold information, (4) Easily misused, (5) Diagram is a mean not an end, (6) Need of precautions and experience, (7) Limitation of accuracy, (8) Only useful in comparative study, (9) Future analysis is not possible.
- **General Rules for Constructing Diagram:** (1) Attractive, (2) Accuracy, (3) Size, (4) Heading, (5) Scale, (6) Drawing, (7) Index, (8) Right-method, (9) Presentation, and (10) Economy.
- **Bar Diagram:** Bar diagrams are those diagrams in which data are presented in the form of bars, or rectangles.
- **Types of Bar Diagram:**
  - **Simple Bar Diagram**: Simple bar diagrams are those diagrams which are based on a single set of numerical data.
  - **Double or Multiple Bar Diagram**: Double or Multiple bar diagrams are used when we have to present two or more attributes with relation to time and space.
  - **Sub-Divided Bar Diagram**: The bar is sub-divided into various parts in proportion to the values given in the data and the whole bar represents the total.
  - **Percentage Sub-Divided Bar Diagram**: It shows simultaneously, different parts of the values of a set of data in terms of percentage. Total value indicated by total length of a bar, is measured to be 100. Each part thereof is shown as a part of 100.
- **Pie Diagram:** Pie diagram is a circle divided into various segments showing the percentage values of a series. This diagram does not show absolute values.

Topic-6 Frequency Diagrams: Histogram, Polygon and Ogive

Revision Notes

- **Diagram of Frequency Distribution:** Frequency distribution diagrams relate to diagrammatic presentation of frequency distribution.
- **Frequency Histograms:** A histogram is a graphical presentation of a frequency distribution of a continuous series. In this class interval should be equal, otherwise we have to make certain adjustments.
- **Frequency Polygon:** If we connect the mid points of the top of each rectangles by straight line that is called frequency polygon.
- **Frequency curve:** A frequency curve is a curve which is plotted by joining the points of frequency polygon by free hand smoothed curve and not by straight line.
- **Ogive:** It is the curve which is constructed by plotting cumulative frequency data on the graph paper in the form of a smooth curve. It can be drawn-less than ogive and more than ogive.

Topic-7 Arithmetic Line Graphs: Time Series Graphs

Revision Notes

- **Line Graphs or Time series:** When statistical series changes with respect to time than it is called time series, when it is plotted on graph paper it is time series graph or time diagram or simply algebraic line graph.
- **Graphic presentation:** Data presented with the help of mathematical graphs is known as graphic presentation.
- **Merits of graphic presentation:** (1) Attractive, interesting and impressive, (2) No knowledge of mathematics required, (3) Simplest method of presenting data, (4) Comparison is made easy, (5) Certain statistical measures can be ascertained with care, (6) No need of training or knowledge.
- **General Rules for constructing a graph:** (1) Title, (2) Structural framework, (3) The proportion of axes, (4) Choice of scale, (5) Use of false base line, (6) Use of scale or Logarithmic scale, (7) Table should be given along with it, (6) Correct impression, (9) Index, (10) Source.
- **Limitations:** Accuracy cannot be checked, illogical, may be misused, cannot be presented with adequate information.
- **One Variable Graphs:** When the value of only one variable is shown with respect to some time period, it is termed as one variable graph.
- **Two or More than two variable Graphs:** When we assume two or more variable as dependent and plotted on the graph with respect to time, it is called two variable graphs.
- **False Base Line:** One important rule in drawing the graph is that the vertical axis must start from zero. That portion of the scale which lies between zero and the smallest value of the variable is omitted. This is called false base line.

Key Terms

- **Statistical Data:** Data is a tool which helps in reaching a sound conclusion on any problem by providing information.

  Primary data: Primary data are those data, which are collected for the first time. They are original in character.
- **Secondary data:** Secondary data are those data, which have already been collected by others. Such type of data is usually available in journals, periodicals, dailies, research publications, official records, etc.
- **Universe:** A large group is known as universe or census.
- **Finite Universe:** If the number of elements in the population is fixed, it is called finite universe.
- **Infinite Universe:** A population is said to be infinite, if it includes a large number of measurement or observations that cannot be reached by counting.
- **Real universe:** It is one in which the items actually exist.
- **Hypothetical Universe:** This type of universe may not actually exist.
- **Sample:** Under sample investigation, some representative units are selected and a detailed study is made thereof. The result obtained from the study of the sample is applicable to the whole universe from which sample is taken.
- **Classification:** Classification is the process of arranging data into sequences and groups according to their common characteristics of separating them into different but selected parts.
- **Variable:** A characteristic which differs or varies from one investigator to another. The difference may be with respect to individuals, items, places or time.
- **Raw Data:** It is an unorganised mass of the various data.
- **Statistical series:** Arranging of data in different classes according to a given order is called statistical series.
- **Tabulation:** Tabulation is the process of systematic presentation of data in columns and rows.

UNIT – III: STATISTICAL TOOLS AND INTERPRETATION

CHAPTER-3

STATISTICAL TOOLS AND INTERPRETATION

Topic-1 Measures of Central Tendency: Arithmetic Mean

Revision Notes

- **Objectives and functions of Statistical Average**:
  - To present the salient features of a mass of complex data
  - To facilitate comparison
  - To know about universe from a sample
  - To trace mathematical relationship
  - To help in decision making
- **Essentials of a good statistical Average**:
  - Rigidly defined
  - Representative
  - Easy to understand
  - Least affected by fluctuations of sampling
  - Certain and absolute number
  - Capable of further algebraic treatment
  - It should not be affected by extreme value, and
  - Easy to compute
- **Kinds of Statistical Average**:
  - Mathematical Averages, and Positional Averages
- **Types of Arithmetic Mean:**
  (a) Simple Arithmetic Mean, and
  (b) Weighted Arithmetic Mean
- **Methods of calculating Simple Arithmetic Mean**
  - **Individual Series**:
  - Direct Method $\bar{x} = \frac{\Sigma x}{N}$
  - Short cut Method $\bar{x} = A + \frac{\Sigma dx}{N}$
  - **Discrete Series**:
  - Direct Method $\bar{x} = \frac{\Sigma fx}{\Sigma f}$; where: $\Sigma f = N$
  - Short cut Method; $\bar{x} = A + \frac{\Sigma fdx}{\Sigma f}$ where: $\Sigma f = N$
  - Step Deviation Method $\bar{x} = A + \frac{\Sigma fd'x}{\Sigma f} \times i$; where: $\Sigma f = N$
  - **Continuous Series:**
  - Direct Method**:** First find out Mid-Values $= \frac{L_1 + L_2}{2}$ Now $\bar{x} = \frac{\Sigma fx}{\Sigma f}$; where: $\Sigma f = N$

- Shortcut Method $\bar{x} = A + \frac{\Sigma dx}{N}$
- Step Deviation Method $\bar{x} = A + \frac{\Sigma fd'x}{N} \times i$

➢ **Calculation of arithmetic mean in cumulative frequency distribution**:

$\bar{x} = A + \frac{\Sigma fd'x}{N} \times i$

➢ **Combined Arithmetic Mean**: $\bar{x}_{12} = \frac{(N_1\bar{x}_1 + N_2\bar{x}_2)}{N_1 + N_2}$

➢ **Weighted Arithmetic Mean**:
- Different items are Weighted according to their significance.
- Items are multiplied by their corresponding weights (W) and we get the weighted values.
- $\bar{x}_w = \frac{\Sigma Wx}{\Sigma f}$

➢ **Algebraic Properties of Arithmetic Mean**:
- If each observation of a series is increased or decreased or multiplied and divided by the some constant, arithmetic mean will be affected in the same manner.
- The sum of deviations of the observations from their arithmetic mean is always zero.
- The sum of the squares of the deviations of the items from their Arithmetic Mean is minimum, *i.e.*, is minimum.
- The arithmetic mean of addition or subtraction of the corresponding value of two series will be equal to the addition or subtraction of the value of the two means.

Topic-2 Measures of Central Tendency: Median (M)

➢ **Merits of Median:** 1. Easy to calculate, 2. Free from the effects of extreme values, 3. Certainty, 4. Graphic Presentation, 5. Suitable for qualitative facts, 6. Real value and 7. Possible even when data is incomplete.

➢ **Demerits of Median:** 1. To arrange the values, 2. Lack of algebraic treatment, 3. Lack of representative character, 4. Effect of sampling.

➢ **Calculation of Median:**
- **In Individual Series**
  - Arrange the series either in ascending order or descending order.
  - In case of odd number of observations, Median = Size of ((n+1)/2)th item and in case of even number of observations, Median = average size of (n/2)th item and ((n/2)+1)th item.
- **Discrete Series:** 1. Arrange the data, 2. Calculate cumulative frequency, 3. Apply the formula.
- **Continuous Series :** 1. Convert the inclusive series into exclusive series, 2. Find out cumulative frequency, 3. Apply the formula

➢ **Determination of Median by Graphic Method:** Construct Less than and More than ogives. Where these curves intersect, that is Median.

➢ **Other Partition Values:** A distribution can be divided into more than two parts like q_1, q_3, p_3, p_5 and so on.

Topic-3 Measures of Central Tendency: Mode (Z)

Revision Notes

➢ **Merits of Mode:** 1. Simple, 2. Graphic determination, 3. Less effect of marginal units, 4. No need of knowledge of all frequencies, 5. Best representative, 6. Helps in understanding the composition of group.

➢ **Demerits of Mode:** 1. Incapable of algebraic treatment, 2. Uncertain and vague, 3. Restricted use, 4. Need for arrangement, 5. Total cannot be obtained, 6. Difficult, 7. Depends on frequencies, 8. Effect of class-interval.

➢ **Location of Mode:**
- **Individual Series** – By Inspection
- **Discrete Series: (i)** By Inspection, **(ii)** Grouping Method,
- **Continuous Series** – After grouping, apply the following formula:

$$Z = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2}$$

- Convert the Inclusive series into Exclusive Series.
- In a symmetric distribution, X = M = Z.

Topic-4 Correlation

Revision Notes

- **Correlation:** Correlation means a casual connection that exists between two series or groups of data.
- **Correlation and Causation:** The existence of correlation between two variable implies relationship between two variable, but does not tell us anything about causes and effect of the relationship.
- **Kinds of Correlation:**
  - **Positive:** It refers to the movement of the variables in the same direction.
  - **Negative:** When two variables move in the opposite direction it is called Negative correlation.
  - **Linear Correlation:** If the ratio of change between two variables is uniform, then it is a case of linear correlation.
  - **Curvilinear:** Amount of change in one variable does not bear a constant ratio to the amount of change in other variables.
  - **Simple Correlation:** When only two variables are involved, then it is a Simple Correlation.
  - **Multiple:** When more than two variables are involved, then it is a Multiple Correlation.
  - **Partial:** The relationship of two variables is studied by eliminating the effect of other variables from both.
- **Degree of Correlation:**
  - **Perfect Correlation:** When change in two related variables are in the same ratio, then it is a case of perfect correlation.
  - **Absence of Correlation:** If there is no relationship between the two variables, then it is a case of absence of correlation.
  - **Limited degree of Correlation:** If there are unequal changes in the two variables in the same direction, correlation is said to be limited positive, and if there are unequal changes in opposite directions, the correlation is limited negative. In this situation, value of coefficient of correlation is more than zero but less than 1. [> 0 but < 1] (in case of limited positive) and more than -1 but less than 0 [>-1 but < 0] (in case of limited negative).
- **Methods of Estimating Correlation**
  - **Scatter Diagram:** A scatter diagram of the data helps in having a visual idea about the nature of association between two variables. It is a graphic expression of the degree and direction of absence of correlation.
    - **Merits of Scatter diagram:**
  - Relationship between two related variables.
  - Simplest Method.
  - Verification by Mathematical Method.
  - Not affected by Extreme values.
    - **Demerits of Scatter diagram:**
  - Not a definite method
  - Fail to produce definite trend
  - When changes are small, no definite shape.
  - **Karl Pearson's Coefficient of Correlation:** The coefficient of correlation (r) of two variables is obtained by dividing the sum of products of corresponding deviations of the various items of two series by the product of their standard deviations.
    - **Direct Method**

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2}\sqrt{\Sigma y^2}} \text{ or } \frac{\Sigma xy}{N\sigma_x\sigma_y}$$

- **Short cut Method**

$$r = \frac{N\Sigma dxdy - (\Sigma dx)(\Sigma dy)}{\sqrt{N\Sigma d^2x - (\Sigma dx)^2}\sqrt{N\Sigma d^2y - (\Sigma dy)^2}}$$

- **Spearman's Rank Difference Method:** First we rank the items according to their position and then differences in ranks are calculated, which is squared to get d^2. Calculate $\sum d^2$. Apply the formula.

$$\rho = 1 - \frac{6(\Sigma d^2)}{n(n^2 - 1)}$$

- When ranks are tied,
  Add in $\sum d^2 \Rightarrow \frac{1}{12}(m^3 - m)$

Topic-5 Index Numbers

Revision Notes

- **Index Numbers:** Index Numbers are devices for measuring differences in the magnitude of a group of related variables.
- **Characteristics of Index Numbers:**
  - Index Numbers are expressed in numbers.
  - Index Numbers explain average change.
  - Comparisons are made with reference to time in Index Numbers.
  - Index Numbers express changes in relative terms.
- **Utility of Index Numbers:**
  - Index Numbers make easy, difficult facts.
  - Index Numbers make comparative study easy.
  - Helpful in measuring irregular changes.
  - Index numbers studies the changes in general price level.
  - Measurement of purchasing power of money.
  - Helpful in forecasting.
  - Helpful in formulating policy.
  - Act as an economic barometer.
- **Limitations of Index Numbers:**
  - Index numbers are generally true.
  - Index Numbers are based on samples.
  - Neglect of quality of a commodity.
  - Does not portray real picture.
  - Defective results can be obtained.
  - Qualitative data are converted into Quantitative data.
  - Limited use.
  - Real comparison of standard of living is not possible.
  - Difference of times.
  - International comparison is not possible.
- **Problems in the construction of Index Numbers:**
  - The purpose of the Index Numbers
  - Selection of base year
  - Selection of items
  - Price Quotations
  - Selection of average

- Selection of appropriate weight
- Choice of an appropriate average

➢ **Simple and Weighted Index Numbers:** Simple index numbers are those in which all items of the series are accorded equal importance. While constructing the index numbers each and every commodity is given weights with its relative importance. This is known as Weighted Index Numbers.

➢ **Construction of Simple Index Numbers:** Two methods:

- **Simple aggregative Method:** Prices of different commodities of the current year are added and the sum is divided by the sum of the prices of those commodities in the base year, and the quotient is multiplied by 100.

$$P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$$

- **Simple Average of Price Relative Method:** A price relative is the price of the current year expressed as a percentage of the price of the base year. It is divided by number of commodities.

$$P_{01} = \frac{\Sigma\left(\frac{P_1}{P_0} \times 100\right)}{N}$$

➢ **Construction of Weightage Average of Price Relative Method:** Two methods.

- **Weighted average of Price relative Method:** First of all calculate Price Relative. Then Multiply by their weights. Now divide by summation of weights.

$$P_{01} = \frac{\Sigma\left[\left\{\frac{P_1}{P_0}\right\} \times W\right]}{\Sigma N} = \frac{\Sigma RW}{\Sigma W}$$

- **Weighted Aggregative Method:** We multiply current Year Prices with base year quantity and also multiply base year quantity with base year price. This was given by Laspeyres.

$$P_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$$

Paasche's formula:

$$P_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$$

Fisher's ideal Index number $= \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1}} \times 100$

➢ **Consumer Price Index –** Index number representing the average change in the prices paid by the ultimate consumers for a specified basket of goods and services is known as Consumer Price Index.

➢ **Construction of CPI:** There are two methods:

- **Aggregative Expenditure Method**

$$P_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$$

- **Family Budget or Weighted average of Price Relative Method.**

$$P_{01} = \frac{\Sigma RW}{\Sigma W}$$

➢ **Wholesale Price Index Number:** Index Number representing general change in the wholesale prices of the commodities is known as Wholesale price Index number.

➢ **Index Numbers of Industrial production:** Index Number measuring the increase or decrease in the level of industrial production in a given period as compared to some base period is known as index of industrial production.

PART-B

UNIT – IV: INTRODUCTORY MICROECONOMICS

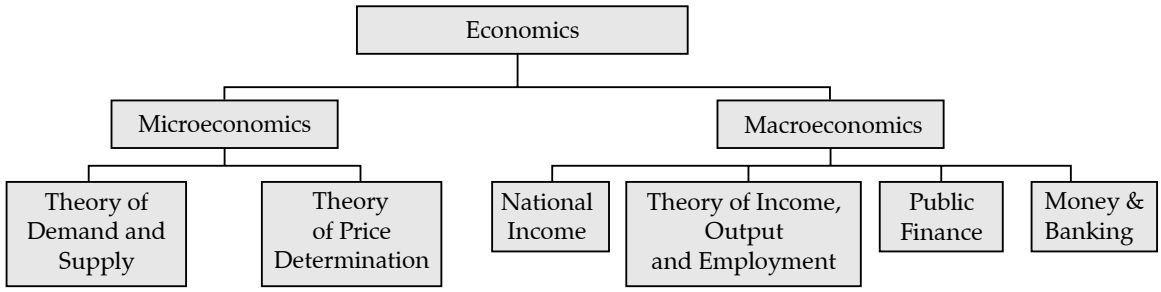
CHAPTER-1

INTRODUCTION

Topic-1 An Introduction to Economics

Revision Notes

- Study of economics is divided into two branches
  (A) Micro Economics
  (B) Marco E economics
- **Micro Economics** studies the behaviour of individual economics units.
  Eg.: Theory of Demand and supply, consumers equilibrium, producers equilibrium product pricing, factor pricing etc.
- **Micro Economics** studies the behaviour of the economy as a whole.
  Eg.: National Income, Aggregate Demand, Aggregate supply, general price level, Inflation etc.
- Macro Economics is called theory of Income and employment.
- **Economics** is a system in which people earn a living to satisfy their wants through process of production, consumption, Investment and exchange.
- **Economics Problem** is the problem of choice arising from use of limited means which have the alternative use for the satisfaction of various wants.
- **Central Problem of an Economy**
  (A) What to produce (Selection of goods)
  (B) How to produce (Selection of technique)
  (C) For whom to produce (Distribution of goods or income)
- **Production Possibility frontier or production possibility curve** shows all possible combinations of two sets of goods that an economy can produce with available resources and given technology, assuming that all resources are fully and efficiently utilized.
- The production possibility curve will shift under two conditions—
  (A) Change in resources,
  (B) Change in technology of production for both the goods.



Topic-2 Economy and Its Central Problems

Revision Notes

- **Causes of economic problems are :**
  (A) Unlimited Human Wants
  (B) Scarcity of Economic Resources
  (C) Alternative uses of Resources
- **Central Problems of an Economy :** At the micro level, every economy faces three central problems, i.e., what to produce, how to produce and for whom to produce.
  (A) What to Produce : The problem of 'what to produce' arises as the producers have limited resources. In an economy, because of scarcity of resources, producers are unable to produce everything in bulk but they will have to make a choice as to which one is important as a whole so that limited resources can be rationally managed. Problem of 'what to produce' involves two-fold decisions : kinds of goods to be produced and quantum of goods to be produced.
  (B) How to Produce : It is concerned with how to organise production. This problem is related to the choice of techniques of production. It arises due to the availability of various techniques for the production of a commodity such as Labour–Intensive Technique and Capital–Intensive Technique.
  (C) For Whom to Produce : The problem of 'for whom to produce' is the problem of distribution of produced goods and services. At the micro level, the decision relates to different sets of buyers in the economy. In an economy, producers would obviously be inclined to produce more for the rich buyers to maximise their profits but government also intervenes to regulate the use of resources so that enough production is done for the poorer sections of the society also.
- **Properties of PPC :** The two basic characteristics or properties of PPC are :
  - **PPC slopes downwards :** It slopes downwards from left to right because more than one goods can be produced only by taking resources away from the production of another goods.
  - **PPC is concave shaped :** PPC is concave to the origin because of increasing MRT, that is, more and more units of a commodity are sacrificed to gain one additional unit of another commodity.
- **Attainable Point :** Any point that lies either on the production possibility curve or to its left is said to be an attainable point.
- **Unattainable Point :** The points that lies to the right of production possibility curve is said to be an unattainable point.
- **Efficient Point :** An efficient point is one that lies on the PPC.
- **Inefficient Point :** The Point that lies within the curve is said to be an inefficient point.
- **Shifts in PPC :** The PPC can shift either towards right or left, when there is change in resources or technology with respect to both the goods.
- **Rotation of PPC :** Rotation of PPC takes place when there is change in resources or technology with respect to only one good.

Key Terms

- **Economy :** An economy is a system that helps to produce goods and services and enables people to earn their living.
- **Economics :** It is a social science which studies the way a society chooses to use its limited resources, which have alternative uses, to produce goods and services and to distribute them among different groups of people.
- **Economic Problem :** Economic problem is the problem of making the choice of the use of scarce resources for satisfying unlimited human wants.
- **Microeconomics :** It studies the behaviour of an individual economic unit. **Example :** Demand of an individual consumer, Production of a firm, etc.
- **Macroeconomics :** It studies the behaviour of the economy as a whole. **Example :** Aggregate Demand, National Income, etc.

- **Positive economics :** It is the branch of economics that concerns the description and explanation of economic phenomena. It focuses on facts and cause-and-effect behavioural relationships and includes the development and testing of economic theories. Positive economics is objective and facts based.
- **Normative economics :** It is a part of economics that expresses value or normative judgments about economic fairness or what the outcome of the economy or goals of public policy ought to be. Normative economics is subjective and value based.

UNIT – V: CONSUMER'S EQUILIBRIUM DEMAND

CHAPTER-2
CONSUMER'S EQUILIBRIUM: UTILITY ANALYSIS & INDIFFERENCE CURVE ANALYSIS

Topic-1 Consumer's Equilibrium and Utility Analysis

Revision Notes

- **Consumer** is an economic agent who consumes final goods and services to fulfil his basic needs.
- The consumer is in equilibrium when, given his income and market prices, he plans his expenditure on different goods and services, in such a manner that he maximises his total satisfaction.
- Law of diminishing marginal utility states that as more and more units of a commodity are consumed, marginal utility derived from every additional unit must decline.
- **Law of Equi-Marginal utility :** The law of equi-marginal utility states that the consumer will distribute his money income between the goods in such a way that the utility derived from the last rupee spent on each goods is equal.
- **Consumer Equilibrium in case of a Single Commodity :** A consumer purchasing a single commodity will be at equilibrium when he is buying such a quantity of that commodity which gives him maximum satisfaction. Being a rational consumer, he will be at equilibrium when marginal utility is equal to the price paid for the commodity, *i.e.*,

$$\frac{MU_x}{P_x} = MU_m$$

Mu_x - Marginal utility of commodity X
P_x - Price of commodity X
MU_m - Marginal utility of Money

- **Consumer Equilibrium in case of Two Commodities :** A consumer purchasing two commodities will be at equilibrium when he spends his limited income in such a way that the ratios of marginal utilities of two commodities and their respective prices are equal and MU falls as consumption increases, i.e.,

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = MU_m$$

Mu_x - Marginal utility of commodity X
MU_y - Marginal utility of commodity Y
Px - Price of commodity X
Py - Price of commodity Y
MU_m - Marginal utility of Money

- **Conditions of Consumer's Equilibrium using Marginal Utility Analysis :**
  - **(i)** Marginal utility of money remains constant.
  - **(ii)** Law of diminishing marginal utility remains valid.
- **Relationship between Total Utility and Marginal Utility :**
  - **(i)** When MU is positive, TU will be increasing.
  - **(ii)** When MU is zero, TU is maximum.
  - **(iii)** When MU is negative, TU will be decreasing.

Topic-2 Indifference Curve Analysis

Revision Notes

- **Properties or Characteristics of Indifference Curves :**
  - **(i)** It slopes downwards from left to right.
  - **(ii)** Indifference Curves are convex to the origin.
  - **(iii)** Indifference Curves will never intersect each other.
  - **(iv)** A higher Indifference Curve represents higher level of satisfaction.
  - **(v)** Indifference Curve neither touches X-axis nor Y-axis.
- **Indifference Map :** It refers to a set of indifference curves corresponding to different income levels of the consumers. An indifference curve which is to the right and above another indifference curve corresponds to higher level of income and therefore, represents higher level of satisfaction.
- **Conditions of Consumer's Equilibrium :**
  - **(i)** $MRS_{xy} = \frac{P_x}{P_y}$ $MRS = \frac{d'y}{d'x}$ = derivative of y with respect to x.
  - **(ii)** At the point of equilibrium, Indifference Curve is convex to the origin.
- **Change in Budget Line :** There can be parallel shift (leftwards or rightwards) due to change in income of the consumer and change in price of goods.

Key Terms

- **Utility :** Want satisfying capacity of goods and services is called utility.
- **Marginal Utility :** It refers to an additional utility on account of the consumption of an additional unit of a commodity. It is calculated as:

$$MU = TU_n - TU_{n-1} \quad or \quad MU = \frac{\Delta TU}{\Delta Q}$$

- **Total Utility :** It is the sum total of utility derived from the consumption of all units of a commodity.
- Cardinal Measurement of Utility : It is that measurement of utility which is measured in terms of units like 2, 4, 6, 8, etc.
- **Ordinal Measurement of Utility :** Comparison of utility depending on consumer's tastes and preferences is called Ordinal Measurement of Utility. It is measured in terms of ranks.
- **Marginal Rate of Substitution (MRS) :** It refers to the number of units of goods Y which the consumer is willing to sacrifice for an additional unit of good X. It is expressed as: $\Delta Y/\Delta X$.
- **Consumer's Bundle :** It is a quantitative combination of two goods which can be purchased by a consumer from his given income at given prices.
- **Budget set :** It is quantitative combination of those bundles which a consumer can purchase from his given income at prevailing market prices.
- **Budget Set :** $PX \cdot X + PY \cdot Y < M$
- **Budget Line :** It is a line showing different combinations of two goods which a consumer can buy by spending his whole income at given price of the goods.
- **Budget line :** $M = PX \cdot X + PY \cdot Y$
- **Consumer Budget :** It states the real income or purchasing power of the consumer from which he can purchase certain quantitative bundles of two goods at given price.
- **Monotonic Preferences :** Consumer's preferences are called monotonic when between any two bundles, consumer always choose a bundle having more of one goods and no less of other goods.
- **Indifference Set :** It is a set of those combinations of two goods which offer the consumer the same level of satisfaction, so that the consumer is indifferent across any number of combinations in his indifference set.
- **Indifference Curve :** It is a curve showing different combination of two goods, each combination offering the same level of satisfaction to the consumer.
- **Indifference Map :** It refers to a set of indifference curves placed together in a diagram.

CHAPTER-3
DEMAND AND ELASTICITY OF DEMAND

Topic-1 Demand and Law of Demand

Revision Notes

- **Demand :** The quantity of a commodity that a consumer is willing and able to buy at each possible price during a given period of time.
- **Demand Schedule :** Demand schedule is a tabular representation in which relationship between price and quantity demanded is exhibited.
  - **(a) Individual Demand Schedule :** It is a tabular representation of different quantity of goods demanded by an individual at different prices in a given time period.
  - **(b) Market Demand Schedule :** It is a tabular representation that shows different quantities of a commodity that all the consumers in the market are willing to buy at different possible prices of the commodity in a given time period.
- **Demand curve and its slope :**

  Demand Curve : Demand Curve is a graphic presentation of a demand schedule showing the relationship between different quantities of a commodity demanded at different possible prices during a given period of time.

  $$\text{Slope of demand curve} = \frac{\text{Change in price}}{\text{Change in quantity demanded}} = \frac{\Delta P}{\Delta Q}$$

  - **(a) Individual Demand Curve :** It is a curve showing different quantities of a commodity that one particular individual buyer is ready to buy at different possible prices of a commodity at a point of time.
  - **(b) Market Demand Curve :** It is a curve showing different quantities of a commodity that all the buyers in the market are ready to buy at different possible prices of a commodity at a point of time.
- **Demand Function :** It is the functional relationship between demand of a goods and factors affecting it. It is expressed as :

  $$Dx = f(Px, Pr, Y, T, E \ldots\ldots)$$
- **Determinants of Demand :** Important determinants of demand are:
  - **(a)** Price of commodity,
  - **(b)** Price of related commodities,
  - **(c)** Money income of the consumers,
  - **(d)** Tastes and preferences of consumers,
  - **(e)** Changes in weather conditions,
  - **(f)** Changes in population,
  - **(g)** Distribution of income,
  - **(h)** Changes in structure of population,
  - **(i)** Changes in quantity of money,
  - **(j)** Distribution of National Wealth,
  - **(k)** Phases of business cycles,
  - **(l)** Change in saving habits, etc.
- **Types of Demand**
  - **(a) Price Demand :** It expresses the inverse functional relationship between the price and demand of a commodity, other things being equal. It is expressed as : $Dx = f(Px)$
  - **(b) Income Demand :** It expresses the direct relationship between income of the consumer and quantity demanded of a commodity, other things remaining constant. It is expressed as :
    - **(i) Normal Goods :** These are those goods whose income effect is positive and price effect is negative.
    - **(ii) Inferior Goods :** These are those goods whose income effect is negative.
  - **(c) Cross Demand :** Other things being equal, when a change in the price of commodity X results in a change in the demand for commodity Y, when X and Y are related goods, is called Cross Demand. It is expressed as : $Dy = f(Px)$
    - **(i) Substitutes :** Substitute good are those goods which can be used in place of one another to satisfy human wants. **For example :** Tea and Coffee are substitutes. When price of a goods increases, the demand of its substitute good also increases and vice versa.

(ii) Complementary Goods : These are those goods which are used together to satisfy a particular want. They complete the demand for each other. **For example :** Car and Petrol. There exists an inverse relationship between price and quantity demanded of complementary goods.

- **Cross Price Effect :** It refers to the effects of a change in price of commodity-X on demand for commodity-Y when X and Y are related goods.
- **Law of Demand :** Other things being equal, it expresses inverse relationship between price of goods and its quantity demanded.
- **Assumptions of Law of Demand:**
  (a) Taste and Preferences of the consumer remain constant,
  (b) There is no change in income of the buyers,
  (c) Prices of the related goods do not change,
  (d) Consumers do not expect any significant change in the availability of the commodity in the near future.
- **Exceptions to the Law of Demand :**
  (a) Prestigious goods,
  (b) Expected rise in future price,
  (c) Ignorance,
  (d) The Giffen Paradox, and
  (e) Necessities.
- **Change in Quantity Demanded :**
  (a) Movement along Demand Curve : When demand of a good changes due to change in its own price it is represented at different points on the same demand curve. It is called, movement along demand curve. It shows 'Extension and Contraction' of demand. Demand curve does not change in both these conditions.
  (i) Extension of Demand : Other things being equal, when demand of a goods increases due to decline in price of that good, then it is called Extension of Demand.
  (ii) Contraction of Demand : Other things being equal, when demand of a goods decreases due to increase in price of that good, it is called Contraction of Demand.
  (d) Shifting of the Demand Curve : Shifts in demand curve takes place when quantity demanded changes due to change in factors other than own price of the commodity. It shows increase or decrease in demand.
  (i) Increase in Demand : When due to change in factors, other than price of goods, demand of goods increases, it is called 'Increase in Demand'. In this case, demand curve shifts to right of the original demand curve.
  (ii) Decrease in Demand : When due to change in factors, other than price of goods, demand of a goods decreases, it is called "Decrease in Demand". In this case, demand curve shifts to left of the original demand curve.

Topic-2 Elasticity of Demand

Revision Notes

- **Price Elasticity of Demand :** Price Elasticity of Demand is defined as the measurement of percentage in quantity demanded in response to a given percentage change in own price of the commodity.

$$E_d = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$E_d = \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} = -\frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

- **Degrees of Price Elasticity of Demand**
  (a) Perfectly Elastic Demand ($E_d = \infty$) : When percentage change in quantity demanded is infinite with a slight rise in the price, then demand for such a commodity is said to be perfectly elastic. In such a situation, demand curve is parallel to X axis.
  (b) Perfectly Inelastic Demand ($E_d = 0$) : When change in price produces no change in demand, then such a demand is called perfectly inelastic demand. In this situation, demand curve is a straight line parallel to the Y axis.
  (c) Unitary Elastic Demand ($E_d = 1$) : When percentage change in quantity demanded is equal to percentage change in price, then demand for such a commodity is said to be unitary elastic. Shape of demand curve is rectangular hyperbola and elasticity at every point on this curve is unity.
  (d) Highly Elastic Demand ($E_d > 1$) : When percentage change in price of a commodity causes greater percentage change in quantity demanded then demand is said to be highly elastic.

(e) Relativity Inelastic Demand ($E_d < 1$) : When the demand is said to be inelastic, percentage change in price of a commodity causes relatively less percentage change in quantity demanded.

➢ **Factors Determining the Elasticity of Demand**

(i) Objective Factors :

(a) Nature of commodity,

(b) Existence of substitutes,

(c) Alternative uses of a commodity,

(d) Postponement of consumption, and

(e) Joint demand.

(ii) Subjective Factors :

(a) Habits of consumers,

(b) Change in income of consumers,

(c) Standard of living of people,

(d) Share in total expenditure, and

(e) Class of buyers.

(iii) Social Factors :

(a) Distribution of National Income, and

(b) Rationing System.

(iv) Price Factors :

(a) General price level, and

(b) Effect of time element.

➢ **Measurement of Elasticity of Demand**

(a) Total expenditure method : Under this method, impact (effect) of change in price on the expenditure of a goods is studied. When price of a goods changes, consumer's total expenditure on it may increase, decrease, or remain constant. Thus, elasticity is measured by comparing the total expenditure made on the goods before and after the price change.

(i) If total expenditure on a commodity remains unchanged before and after the price change, the elasticity is said to be unity $E_d = 1$.

(ii) If total expenditure increase with fall in price (and vice-versa), elasticity of demand is said to be greater than unity $E_d > 1$.

(iii) If total expenditure decreases with fall in price (and vice-versa), elasticity of demand is said to be less than unity $E_d < 1$.

(b) Proportionate or Percentage Method or Percentage Change Method : The percentage method measures price elasticity of demand by dividing the percentage change in amount demanded by percentage change in price of commodity.

(i) The elasticity of demand is Unitary, greater than Unitary and less than Unitary.

(ii) Demand is Unitary if change in demand is proportionate to the change in price.

(iii) Demand is greater than Unitary when change in demand is more than proportionate change in price.

(iv) The demand is less than Unitary if change in demand is less than proportionate change in price.

(v) The co-efficient of price elasticity of demand is always negative because change in price brings a change in demand in opposite direction.

$$E_d = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

$$E_d = (-)\ \frac{\Delta Q}{\Delta P} = \frac{P}{Q}$$

➢ Percentage method measures price elasticity of demand by dividing the percentage change in amount demand by percentage change in price of commodity.

Key Terms

- **Quantity Demanded :** Quantity Demanded refers to a specific quantity to be purchased against a specific price of a commodity.
- **Income Effect :** It refers to change in quantity demanded of a commodity when real income of the consumer changes owing to change in own price of the commodity.
- **Substitution Effect :** It refers to change in quantity demanded of commodity-X when relative price of the commodity (Px/Py) changes owing to change in Px.
- **Price Effect :** It refers to change in quantity demanded of a commodity owing to change in its own price, other things remaining constant.
- **Law of Demand :** Other things being equal, it expresses inverse relationship between price of goods and its quantity demanded
- **Giffen Goods :** Those goods whose income effect is negative and price effect is positive are known as Giffen Goods. Law of Demand is not applicable in case of Giffen Goods.
- **Price Elasticity of Demand :** Price Elasticity of Demand is defined as the measurement of percentage in quantity demanded in response to a given percentage change in own price of the commodity.
- **Perfectly Elastic Demand ($E_d = \infty$) :** When percentage change in quantity demanded is infinite with a slight rise in the price, then demand for such a commodity is said to be perfectly elastic. In such a situation, demand curve is parallel to X axis.
- **Perfectly Inelastic Demand ($E_d = 0$) :** When a change in price produces no change in demand, then such a demand is called perfectly inelastic demand. In this situation, demand curve is a straight line parallel to the Y axis.
- **Unitary Elastic Demand ($E_d = 1$) :** When percentage change in quantity demanded is equal to percentage change in price, then demand for such a commodity is said to be unitary elastic. Shape of demand curve is rectangular hyperbola and elasticity at every point on this curve is unity.
- **Highly Elastic Demand ($E_d > 1$) :** When percentage change in price of a commodity causes greater percentage change in quantity demanded then demand is said to be highly elastic.
- **Relativity Inelastic Demand ($E_d < 1$) :** When the demand is said to be inelastic, percentage change in price of a commodity causes relatively less percentage change in quantity demanded.

UNIT – VI: PRODUCER BEHAVIOUR AND SUPPLY

CHAPTER-4

PRODUCTION FUNCTION

Revision Notes

- Addition to utility should be regarded as production which brings about an addition in the value of goods.
- **Production Function** shows the functional relation between physical inputs and physical output of a goods. It can be expressed as $Q = (f_1, f_2, f_3 \ldots f_n)$. Where Q = Physical output of a good; $f_1, f_2, f_3, \ldots\ldots f_n$ = Physical inputs. Technology remains constant.
- **Types of Production Function :** There are two types of Production Function :
  - **(i) Short Run Production Function or Returns to a Factor :** In this production function, one factor of production is variable and all others are fixed. So, law of return to a factor is applied. It is also called variable proportion type production function.
  - **(ii) Long Run Production Function or Returns to Scale :** In this production function, all the factors of production are variable. So, law of returns to scale is applied. It is also called return to scale.
- **Total Product or Total Physical Product (TP) :** Total product refers to total output produced by a firm during a given period of time with given number of inputs.

- **Average Product (AP) :** Average Product refers to output per unit of a variable input. To get Average Product, we divide total product by amount of variable factor.

$$AP = \frac{TP}{L}$$

- **Marginal Product (MP) :** Marginal Product is the change in Total Product resulting from the use of one more (or one less) unit of the variable input, keeping all other inputs constant.

$$MP = \frac{\Delta TP}{\Delta N}$$

OR

$$MP_n = TP_n - TP_{(n-1)}$$

- **Law of Production or Law of Variable Proportion :** Law of Variable Proportion states that as more and more units of the variable factor are combined with the fixed factor, a stage must ultimately come when marginal product of the variable factor starts declining. According to this law, there are three stages of production :
  - **(i) First Stage :** Total Product increases at an increasing rate and Marginal Product rises till it reaches its maximum point.
  - **(ii) Second Stage :** Total product increases at a decreasing rate and reaches maximum, and MP becomes zero.
  - **(iii) Third Stage :** Total product also decreases and marginal product (MP) becomes negative.
- **Causes of the Operation of Law of Variable Proportion :**
  - **(i)** Indivisibility of factors,
  - **(ii)** Division of labour or specialisation,
  - **(iii)** Imperfect substitute,
  - **(iv)** Change in factor ratio.
- **Postponement of the law of variable proportion :** Improvement in technique of production and discovery of fixed factor substitute can postpone the operation of Law for some time, but ultimately it will apply.
- **Relation between Total, Average and Marginal Product :**
  - **(i)** So long as marginal product rises, total product increases at increasing rate.
  - **(ii)** When marginal product starts falling but remains positive, total product rises at diminishing rate.
  - **(iii)** When MP = 0, TP is maximum.
  - **(iv)** When marginal product becomes negative, then total product starts falling.
- **Relation between MP and AP**
  - **(i)** When MP > AP, AP rises.
  - **(ii)** When MP = AP, AP is maximum and constant.
  - **(iii)** When MP < AP, AP falls.
- **Returns to a factor :** In a short period when additional unit of variable factors are employed with fixed factors, then returns to a factor operates. Returns to a factor shows the changes in total product of a goods when only the quantity of one input is increased, while other inputs are kept constant.

Key Terms

- **Point of inflexion :** It is a point where the slope of TP curve changes from convex to concave. From this point TP increases but at a diminishing rate.
- **Imperfect substitutes :** Imperfect substitutes refers to a product or service that cannot be used in exactly the same way as the goods or service it replaces.
- **Fixed Factors :** Factor inputs whose quantity does not vary from day-to-day like machinery, management building etc. are known as fixed factors or fixed inputs.
- **Variable Factors :** Factor inputs whose quantity may vary from day-to-day, like labour, raw materials, etc., are known as variable factors or variable inputs.

CHAPTER-5

COST OF PRODUCTION AND REVENUE

Topic-1 Cost of Production

Revision Notes

- **Cost :** It refers to the expenditure incurred by a producer on the factor as well as non-factor inputs for a given quantity of output of a commodity.
- **Cost Function :** A Cost Function shows the functional relationship between output and cost of production. It is given as : $C = f(Q)$
- **Cost of Production :** It refers to the expenditure incurred by a producer used in the process of production on factor as well as non-factor inputs.
- **Opportunity Cost :** Opportunity Cost is the cost of the next best alternative foregone.
- **Money Cost :** The money cost of producing a certain output of a commodity is the sum of all the payments to the factors of production engaged in the production of that commodity.
- **Explicit Costs :** Explicit Costs are those cash payments which firms make to outsiders for their services and goods.
- **Implicit Costs** : Implicit Costs are the costs of entrepreneurs' own factors or resources.
- **Normal Profits :** The minimum return which the entrepreneur must receive to continue the production process.
- **Cost :** Explicit cost + Implicit cost + Normal Profit.
- **Total Fixed Costs or Supplementary Cost :** Fixed Costs are the sum total of expenditure incurred by the producer on the purchase or hiring of fixed factors of production.
- **Total Variable Costs :** Variable Costs are the expenditure incurred by the producer on the use of variable factors of production.
- **Total Costs :** It is the total expenditure incurred by a firm on the factors of production required for the production of a commodity.

  TC = TFC + TVC.
- **Average Costs :** Cost per unit of output is called Average Cost. It is obtained by dividing the total cost by the quantity of output.

$$AC = \frac{TC}{Q}$$

- **Average Fixed Cost (AFC) :** It is defined as the fixed cost of producing one unit of the commodity. It is obtained by dividing TFC by the level of output.

$$AFC = \frac{TFC}{\text{Number of Units Produced}} = \frac{TFC}{Q}$$

- **Average Variable Cost (AVC) :** It is defined as the variable cost of producing one unit of commodity. It is obtained by dividing TVC by the level of output

$$AVC = \frac{TVC}{\text{Number of Units Produced}} = \frac{TVC}{Q}$$

- **Marginal Cost :** Marginal Cost is the addition made to the total cost by the production of one more unit of a commodity.

$$MC = TC_n - TC_{(n-1)}$$

or

$$MC = \frac{\Delta TC}{\Delta Q} \text{ or } \frac{\Delta TVC}{\Delta Q}$$

- **Relationship between Average Cost (AC) and Marginal Cost (MC) :**

  (i) Both are derived from TC.

  (ii) When AC falls, MC is lower than AC.

(iii) When AC rises, MC is greater than AC.
(iv) MC cuts AC at its minimum point.

- **Relationship between TC and MC :**
  (i) MC is the addition to total cost, when one more unit of output is produced. MC is calculated as : $MC_n = TC_n - TC_{n-1}$.
  (ii) TC increases at an increasing rate when MC is increasing.
  (iii) TC increases at a constant rate when MC is constant.
  (iv) TC increases at a diminishing rate when MC is decreasing.

Topic-2 Revenue

Revision Notes

- **The concept of revenue consists of three important terms :** Total Revenue (TR), Average Revenue (AR) and Marginal Revenue (MR)
- **Revenue/Total Revenue :** Total revenue of a firm is its sales receipts or total money receipts of a firm from the sale of a given output is called Total Revenue.
- **Average Revenue (AR)** : Average revenue is the per unit revenue received from the sale of one unit of a commodity.

$$AR = \frac{TR}{Q}$$

- Average revenue curve and demand curve are one and same thing. Average revenue is also called firms' price line.
- **Marginal Revenue :** Marginal revenue is the change in total revenue which results from the sale of one more or one less unit of output.

$$MR = TR_n - TR_{n-1}$$

Or

$$MR = \frac{\Delta TR}{\Delta Q}$$

- **Revenue Curves in Different Markets :**
  (A) In perfect competition, AR is a horizontal line parallel to 'X' axis. It is equal to MR and TR curve is a straight positively sloping line from the origin and TR increases in same proportion as increase in output sold. The area below the price line is total revenue in perfect competition.
  (B) In monopoly and monopolistic competition, AR and MR both are downward sloping and MR is always below AR. The main difference in these two markets is that in monopolistic competition, AR and MR curve is more elastic than monopoly.
- Relationship between TR and MR :
  (A) Initially or at first unit TR = MR
  (B) When TR increases at increasing rate then MR also increases.
  (C) When TR increases at constant rate then MR is also constant.
  (D) When TR increases at a diminishing rate then MR declines.
  (E) When TR is maximum, MR is zero.
  (F) When TR declines, MR is negative.
- Relation between AR and MR :
  (A) If AR is constant, AR = MR
  (B) If AR is diminishing, AR > MR
  (C) MR can be negative, but AR is always positive.
- **Negative (MR) :** It is possible only when price is declining under monopoly or monopolistic competition. It is not possible in case of perfect competition where price remains constant for a firm.
- **AR Curve is Firm's Demand Curve :** Firm's demand curve is a curve showing relationship between price of the products and its quantity demanded in the market.

- **AR Curve is a Horizontal Straight Line under Perfect Competition :** A firm under perfect competition is a price taker. It cannot influence/change the market price, implying a constant AR for a firm corresponding to all levels of output.
- **AR Curve Slopes Downwards under Conditions of Monopoly and Monopolistic Competition :** Under monopoly and monopolistic competition, more of the commodity can be sold only at a lower price. This implies an inverse relationship between price of the commodity and demand for the firm's output. Hence, the demand curve of the firm slopes downward.
- **Relation between TR, AR and MR when more quantity sold at the same price under perfect competition :**
  - **(A)** Average revenue and marginal revenue remains constant at all levels of output and AR and MR curves are parallel to x-axis. (AR = MR)
  - **(B)** Total revenue increases at constant rate MR is constant and TR curve is positively sloped straight line passing through the origin.
- Relation between TR, AR and MR when more quantity is sold at the lower price or there is monopoly or monopolistic competition in the market.
  - **(A)** Average revenue and marginal revenue curves have negative slope. MR curve lies below AR curve. (AR > MR)
  - **(B)** Marginal revenue falls twice the rate of average revenue.
  - **(C)** So long as marginal revenue decreases and positive, total revenue increases at diminishing rate. When marginal revenue is zero, total revenue is maximum and when marginal revenue becomes negative, TR starts falling.

Key Terms

- **Imputed Costs :** An imputed cost is a cost that is incurred by virtue of using an assets instead of investing it or undertaking an alternative course of action.
- **Real Costs :** Besides explicit costs and implicit costs, real costs also include certain subjective factors like emotions, sacrifices, love etc.
- **Revenue/Total Revenue :** Sales receipts or total money receipts of a firm from the sale of a given output is called Total Revenue.
- **Average Revenue (AR) :** Average revenue is the per unit revenue received from the sale of one unit of a commodity.
- **Marginal Revenue :** Marginal revenue is the change in total revenue which results from the sale of one more or one less unit of output.

CHAPTER-6

PRODUCER'S EQUILIBRIUM

Revision Notes

- **Conditions of Profit Maximisation :**
  - **(A) Necessary Condition :** MR must equal to MC.
  - **(B) Supplementary Condition :** MC should cut MR from below. It simply means after equilibrium point MC should be greater than MR or MC is rising.
- **Concept of Producer's Equilibrium :** It refers to the stage where producer is getting maximum profit or minimum uses with given cost and he has no incentive to increase or decrease the level of output.
- **There are two methods for determination of Producer's Equilibrium :**
  - **(i)** Total Revenue and Total Cost Approach (TR and TC Approach)
  - **(ii)** Marginal Revenue and Marginal Cost Approach (MR and MC Approach).
- **Producer can attain the equilibrium level under two different situations :**
  - **(i)** When the Price remains Constant (it happens under Perfect Competition). In this situation, firm has to accept the same price as determined by the industry. It means, any quantity of a commodity can be sold at that particular price.

(ii) When the price falls with rise in output (it happens under Imperfect Competition). In this situation, firm follows its own pricing policy. However, it can increase sales only by reducing the price.

- **Firm's Equilibrium under Time Period**

(A) In Short Run : Three conditions :

(i) MR = MC.

(ii) MC should be greater than MR after equilibrium point.

(iii) Price should be either equal to or more than AVC.

(B) In Long Run

(i) MR = MC.

(ii) After equilibrium MC should be greater than MR.

(iii) Price should be either equal to or more than AC.

Key Terms

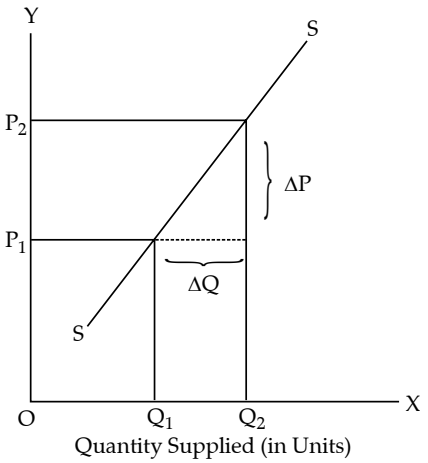
- **Producer :** A producer is one who produces goods and services for the generation of income.
- **Normal profits :** Normal profits are defined as the minimum return that the producer expects from his capital invested in the business. It is a situation when TR = TC.
- **Abnormal profits :** It is a situation when TR > TC.
- **Sub-normal profits (or losses) :** It is a situation when TR < TC.
- **Producer's or Firm's Equilibrium :** A producer is said to be in equilibrium when he maximises his profit or minimises his losses.
- **Profit :** The difference between TR and TC is profit. π = TR – TC
- **Breakeven point :** It occurs when a firm is able to cover all its costs of production. This situation prevails at the point where TC = TR or where, AR = AC.
- **Shut down point :** It occurs when a firm is not able to recover its variable costs.

CHAPTER-7

CONCEPT OF SUPPLY

Revision Notes

- **Factors Affecting Supply :**
  - **(i)** Know the Terms of commodity
  - **(ii)** Price of related goods
  - **(iii)** Price of factor inputs
  - **(iv)** Goal of the firm
  - **(v)** Level of technology
  - **(vi)** Expected change in price
  - **(vii)** Number of firms in the industry
  - **(viii)** Government policies.
- **Types of Supply Schedules :**
  - **(i)** Individual Supply Schedule
  - **(ii)** Market Supply Schedule
- **Types of Supply Curve :**
  - **(i)** Individual Supply Curve
  - **(ii)** Market Supply Curve
- Slope of supply curve = $\Delta P/\Delta Q$



- **Change in Supply : I**t is of two kinds :
  - **(i)** Movement along a supply curve due to change in prices.
  - **(ii)** Shifting of supply curve due to change in factors other than price.
- **Movement along the Supply Curve :** Two types of movement :
  - **(i) Extension of Supply :** Other things being constant, when supply increases due to increase in price only, it is termed as "Extension of Supply";
  - **(ii) Contraction of Supply :** Other things being constant, when supply decreases due to decrease in price only, it is termed as "Contraction of supply.''
- **Shifting of Supply Curve :** Two types of shifting :
  - **(i) Increase in Supply :** It refers to a rise in the supply of a commodity caused due to any factor other than own price of the commodity.
  - **(ii) Decrease in Supply :** It refers to a fall in the supply of commodity caused due to any factor other than own price of the commodity.
- **Causes of Increase in Supply :**
  - **(i)** Fall in the price of competing product.
  - **(ii)** Fall in the price of factors of production.
  - **(iii)** Improvements in technology.
  - **(iv)** Increase in the number of firms in the market.
  - **(v)** Reduction in taxes or grant of subsidy.
- **Causes of Decrease in Supply :**
  - **(i)** Obsolescence of technology.
  - **(ii)** Increase in the prices of substitute.
  - **(iii)** Increase in factor prices.
  - **(iv)** Increase in taxation or withdrawal of subsidy.
  - **(v)** Decrease in the number of firms in the market.

Key Terms

- **Stock :** It refers to the total quantity of goods which is available with the sellers in the market at a particular point of time.
- **Supply :** Supply refers to the quantity of a commodity that a firm is willing and able to offer for sale at a given price during a given period of time.
- **Supply Schedule :** It is a tabular statement which shows various quantities of a commodity being supplied at various levels of price during a given period of time.

- **Individual Supply Schedule :** It is a schedule which represents different quantities of a commodity which an individual producer or seller is ready to supply at various possible prices at a given period of time.
- **Market Supply Schedule :** It is a schedule which represents the total quantity of a commodity that all producers will supply at each market price per period of time. It is a horizontal summation of individual supply schedules.
- **Supply Curve :** It is a graphical representation of the supply schedule.
- **Individual Supply Curve :** It shows the quantity supplied by an individual firm at various prices.
- **Market Supply Curve :** It shows the quantities supplied by all the firms taken together in a market at various prices.
- **Supply Function :** It refers to functional relationship between supply of a commodity and its determining factors.
- **Law of Supply :** Other things being constant, supply increases with rise in price and supply decreases with fall in price.

CHAPTER-8

ELASTICITY OF SUPPLY

Revision Notes

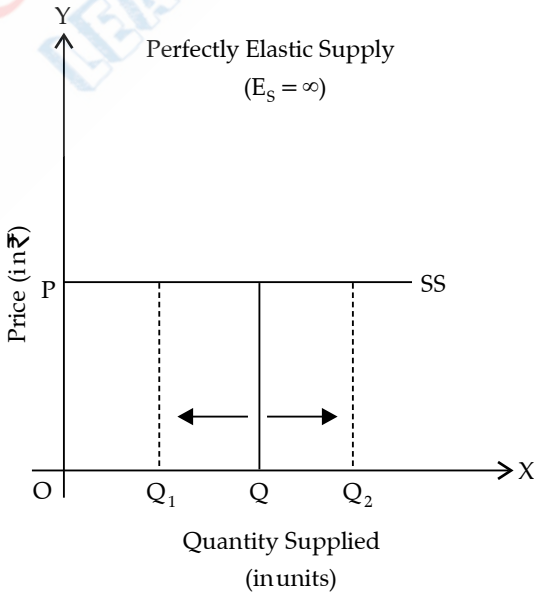
- **Elasticity of Supply :** It refers to the degree of responsiveness of quantity supplied of a commodity with reference to a change in price of the commodity. It is always positive due to direct relationship between price and quantity supplied.

$$e_S = \frac{\text{Proportionate Change in Quantity Supplied}}{\text{Proportionate Change in Price}}$$

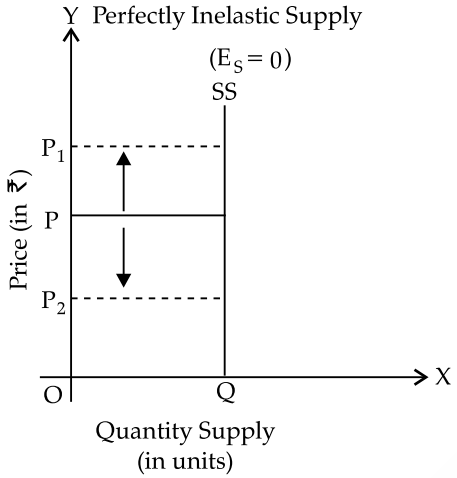
$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

- **Degrees of Elasticity of Supply :**

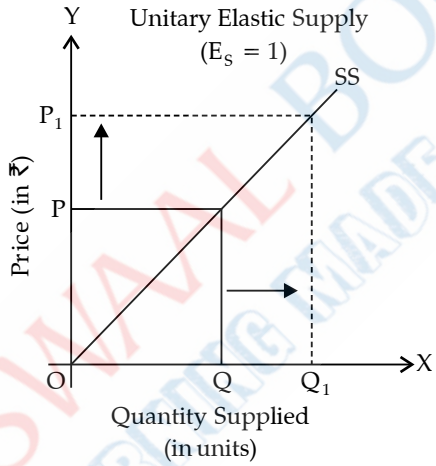
(i) Perfectly Elastic Supply ($e_S = \infty$) : When there is an infinite supply at a particular price and the supply becomes zero with a slight fall in price, then the supply of such commodity is said to be perfectly elastic.



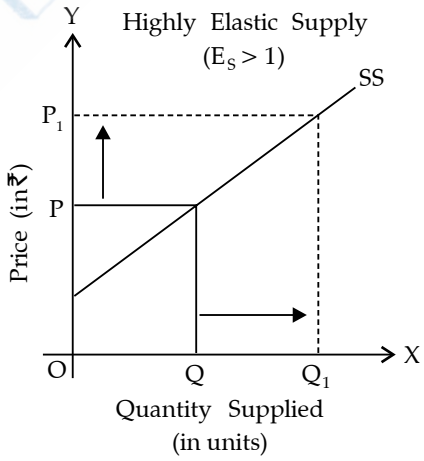
(ii) Perfectly Inelastic Supply ($e_S = 0$) : When no change in quantity supplied takes place even after a price change, elasticity of supply is said to be zero.



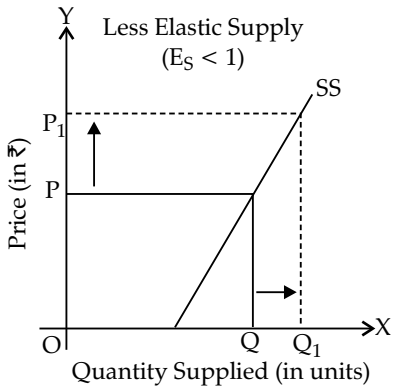
(iii) Unitary Elastic Supply (e_S = 1) : When the proportionate change in quantity supplied is equal to the proportionate change in price, the elasticity of supply is said to be equal to one.

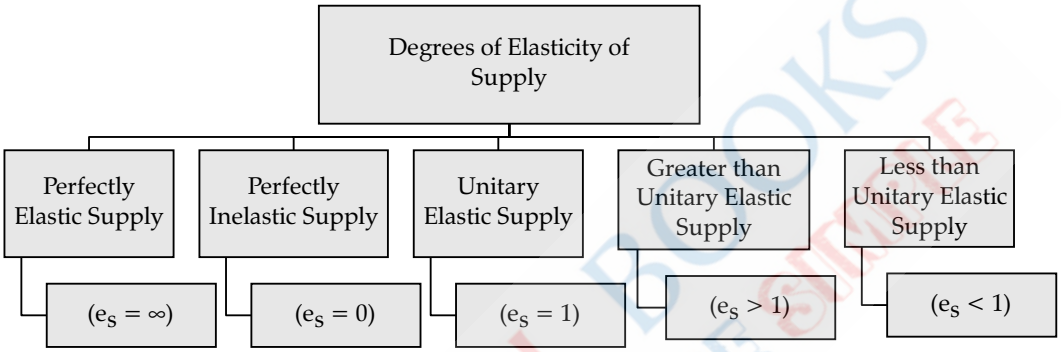


(iv) Elastic or Greater than Unitary Elastic Supply (e_S > 1) : When the proportionate change in quantity supplied is more than proportionate change in price, elasticity of supply is said to be greater than unity.



(v) Inelastic or Less than Unitary Elastic Supply (e_S < 1) : When the proportionate change in quantity supplied is less than the proportionate change in price, elasticity of supply is said to be less than unitary.





- **Measurement of Elasticity of Supply :**
  Percentage or Proportionate Method :

$$e_S = \frac{\text{Change in Supply}}{\text{Initial Supply}} \Big/ \frac{\text{Change in Price}}{\text{Initial Price}} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

- **Factors influencing Elasticity of Supply :**
  - **(i)** Nature of commodity
  - **(ii)** Cost of production
  - **(iii)** Estimates of future prices
  - **(iv)** Natural constrains
  - **(v)** Techniques of production
  - **(vi)** Nature of inputs used
  - **(vii)** Time element

Key Terms

- **Supply :** It implies the quantity of a commodity which is actually brought into the market for sale.
- **Quantity Supplied :** Quantity Supplied is the quantity of a commodity that producers are willing to sell at a particular price at a particular point of time.

UNIT – VII: FORMS OF MARKET AND PRICE DETERMINATION UNDER PERFECT COMPETITION WITH SIMPLE APPLICATIONS

CHAPTER-9
PERFECT COMPETITION WITH SIMPLE APPLICATIONS

Revision Notes

- **Types of Market :** On the basis of competition :
  - **(i)** Perfect competition,
  - **(ii)** Monopoly,
  - **(iii)** Monopolistic competition and
  - **(iv)** Oligopoly.
- Under perfect competition, per unit price remains constant therefore, average and marginal revenue curves coincide each other and become parallel to x-axis.
- **Characteristics or Features of Perfect Competition :**
  - **(i)** Large number of buyers and sellers,
  - **(ii)** Homogeneous products,
  - **(iii)** Free entry and exit,
  - **(iv)** Perfect knowledge,
  - **(v)** Perfect mobility of factors of production,
  - **(vi)** Absence of transportation cost,
  - **(vii)** No selling cost,
  - **(viii)** Uniform prices, and
  - **(ix)** Horizontal average and marginal revenue curves.
- **Two important conclusions of Perfect Competition Market :**
  - **(i)** Firm is price-taker not price-maker,
  - **(ii)** Perfectly elastic demand curve.
- In practice, very few industries can be described as perfectly competitive, though agriculture comes close.
- In a perfectly competitive market, there are many producers and consumers, no barriers to exit and entry into the market, perfectly homogeneous goods, perfect information, and well-defined property rights.
- Perfectly competitive producers are price-takers that can choose how much to produce, but not the price at which they can sell their outputs.
- Under perfect competition, price is determined by the market forces of demand and supply in an industry. No individual firm or buyer can influence the price of the product. So industry is price-maker and firm is price-taker
- **Effect of Change in Demand :** Increase in demand raises and decrease in demand lowers the equilibrium price. Also, equilibrium quantity will increase when demand increases and will decrease when demand decreases. However,
  - **(i) In Case of Perfectly Elastic Supply : I**ncrease or decrease in demand for a commodity does not cause any change in its price in case the supply of the commodity is perfectly elastic.
  - **(ii) In Case of Perfectly Inelastic Supply :** Increase or decrease in demand causes a change in the price of the commodity. Equilibrium quantity remains constant.
- **Effect of Change in Supply :** Increase in supply causes a fall in equilibrium price and decrease in supply causes a rise in equilibrium price. Equilibrium quantity will increase if supply increases and decrease if supply decreases. However :
  - **(i) In Case of Perfectly Elastic Supply :** Increase or decrease in demand for a commodity does not cause any change in its price in case the supply of the commodity is perfectly elastic.

(ii) In Case of Perfectly Inelastic Supply : Increase or decrease in demand cause a change in the price of the commodity. Equilibrium quantity remains constant.

- **Effect of a simultaneous change in Demand and supply in equilibrium Price :**
  - **(i)** When demand increases more than supply, equilibrium price will increase.
  - **(ii)** When demand and supply increase equally, equilibrium price remains constant.
  - **(iii)** When supply increases more than demand, equilibrium price falls.
- **Applications of Demand and Supply :**
  - **(i) Price Ceiling :** It is the maximum price, the producers of goods or services are allowed to charge. Government imposes such a ceiling below the equilibrium price when it finds that the demand for necessary goods exceeds its supply, that is, when consumers are facing shortages and equilibrium price is too high. Government does it in the interest of consumers.
  - **(ii) Price floor :** Government imposes lower limit on the price, which is higher than the equilibrium price or above the equilibrium price to safe guard the interest of producers. The price is also called minimum support price and price floor.

Key Terms

- **Market :** Market is a system through which the buyers and sellers of a commodity or service comes in contact of one another for sale and purchase of the commodity or service on specific price.
- **Perfect Competition :** It is defined as the situation in which large number of sellers sell homogeneous products at uniform price in the market.
- **Perfect Information :** The assumption that all consumers know all things, about all products, at all times, and therefore, always make the best decision regarding purchase.
- **Market Equilibrium :** It is a state in which market demand is equal to market supply.
- **Equilibrium Price :** It is the price at which market demand is equal to market supply.
- **Equilibrium Quantity :** It is the quantity which corresponds to equilibrium price.

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