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SEM-II

Subject

Business Mathematics & Statistics-II

Theory Part

CHAPTER 1ST MATRICES AND DETERMINANTS

1. Explain types of matrices-

Matrix

A matrix is collection of numbers and arranged into a fixed numbers of rows and columns any elements in matrix maybe located by stating the number of rows and number of column in which the element occurs

Row means horizontal line (→) and column means vertical line (↓)

Matrix denoted by Row X Column

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} \rightarrow \begin{vmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{vmatrix}$$

i.e. RC mean 3 X 3

Types of Matrices

1. Row matrix

A matrix has one only 1 row call row matrix.

$$[1 \quad 2 \quad 3]$$

2. Column matrix

Matrix having only one column is called column matrix.

$$\begin{vmatrix} 1 \\ 2 \\ 3 \end{vmatrix}$$

3. Rectangular matrix

It means number of rows is not equal to number of column is called rectangular matrix.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{vmatrix}$$

4. Square matrix

It means number of rows are equal to number of column is called square matrix.

$$\begin{vmatrix} 1 & 2 \\ 4 & 5 \end{vmatrix}$$

5. Diagonal matrix

Square Matrix in which all the non-diagonal elements are zero is called diagonal matrix.

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

6. Scalar matrix

A diagonal Matrix in which all the diagonal elements are equal is called scalar matrix.

$$\begin{vmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{vmatrix}$$

7. Unit or identity matrix

Scalar Matrix in which all diagonal elements are one is called a unit matrix.

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

8. Upper triangular matrix

Square Matrix in which all the elements below the principle diagonal are zero is called an upper triangular matrix.

$$\begin{vmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{vmatrix}$$

9. Lower triangular matrix

A square Matrix in which all the elements about principal diagonal are zero is called lower triangular matrix.

$$\begin{vmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 3 & 5 & 6 \end{vmatrix}$$

10. Null/zero matrix

When all elements are zero is called zero matrix.

$$\begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix}$$

11. Transpose of matrix

When elements change their Rows into column and it denoted by A^t

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} \longrightarrow \begin{vmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{vmatrix}$$

2. Explain properties of determinants-

Determinants

The determinant is scanner valley that can be completed from the element of square matrix and encodes certain properties of linear transformation describe by matrix it is addicted by **|D|**

Properties of determinants

1) The value of a determinant remains uncharged if its rows and columns are interchanged.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} \longrightarrow \begin{vmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{vmatrix}$$

2) The value of determinant is changed in sign only if any two rows or column in it are interchanged.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} \longrightarrow \begin{vmatrix} 7 & 4 & 1 \\ 8 & 5 & 2 \\ 9 & 6 & 3 \end{vmatrix}$$

3) The value of determinant is zero if any two rows or columns in it are identical.

$$\begin{vmatrix} 1 & 2 & 3 \\ 2 & 4 & 1 \\ 1 & 2 & 3 \end{vmatrix} = 0$$

4) If all the elements of a rows and columns are multiplied by a constant then it is equivalent to multiplying the determinant by the constant.

$$\begin{vmatrix} 10 & 20 & 10 \\ 40 & 30 & 15 \\ 70 & 80 & 25 \end{vmatrix} \longrightarrow = 5 \begin{vmatrix} 2 & 4 & 2 \\ 8 & 6 & 3 \\ 14 & 16 & 5 \end{vmatrix}$$

5) To determinants can be added if they have two identical rows or column.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} + \begin{vmatrix} 7 & 4 & 1 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = \begin{vmatrix} 8 & 6 & 4 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

6) The value of a determinant remains the same if “k” multiplies of any raw or column are added to corresponding of any other row/column

$$\begin{vmatrix} 5 & 4 \\ 1 & 6 \end{vmatrix} = 5 \times 6 - 1 \times 4 = 30 - 4 = \underline{26}$$

Suppose elements of second row are multiplied by 100 and added to first row

1 X 100=100 and 6 X 100=600

$$\begin{vmatrix} 5+100 & 4+600 \\ 1 & 6 \end{vmatrix} = \begin{vmatrix} 105 & 604 \\ 1 & 6 \end{vmatrix} = 105 \times 6 - 1 \times 604 = 630 - 604 = \underline{26}$$

3. Explain application in business and economics

Applications in Business and Economics are gives below:

1) Reconciling Theoretical Concepts of Economics in Relation to the actual Business Behaviour and Conditions:

Analytical techniques of economic theory build models by which we arrive at certain assumptions and conclusions arc reached thereon in relation to certain firms. There is need to reconcile the theoretical principles based on simplified assumptions with actual business practice and develop or reformulate the economic theory, if necessary.

2) Estimating Economic Relationship:

Measurement of various types of elasticity of demand like price elasticity, income elasticity, cross elasticity, substitution elasticity, etc., arc provided by economics. The estimates of these economic relationships can be used for purpose of business forecasts.

3) Predicting Economic Quantities:

Most of the business decisions are taken in an environment of uncertainty. Economic analysis makes possible the forecasting of economic quantities like profit, demand, production costs, price, capital and other relevant quantities. The task of taking business decisions and formulating forward plans becomes simpler and less risk) due to prediction of economic quantities.

4) Basis of Business Policies:

Business policies and plans for the future can be formulated on the basis of economic quantities.

5) Helpful in understanding the External Forces Constituting the Environment:

The business management has to see the relevance and effects of external forces such as business cycle, trends in national income and expenditure, government policies relating to taxation, licensing and price control etc.

CHAPTER 2ND LINEAR PROGRAMMING PROBLEMS

1. Explain the following terms-

1) Decision variables

In the formulation of lpp or any model in operations research one has to decide the unknowns to be found out. These unknowns are called as decision variables. The decision variables may take non negative values or they are unrestricted in sign

2) Constraints equation

The conditions or limitations in the given problem are expressed in terms of equation or inequalities in terms of decision variables are called as constraints in lpp the constraints are a linear in nature.

3) Objective function

The goal or objective to be achieved in the model is called as objective function it is to be maximized or minimized in the objective function is linear in nature.

CHAPTER 3RD CORRELATION AND REGRESSION

1. Types of correlation-

1. Positive correlation

Increase in value of 1 variable is associated with increase in value of other variable
decrease in value of 1 variable is associated with decrease in value of other variable
this correlation is also called positive correlation

For example mark and intelligent quotient

2. Negative correlation

Increase in value of one variable is accompanied by decrease in value of other variable
and vice versa means changes exist in opposite direction is called negative correlation.

For example supply and price or demand and price of commodity.

3. No correlation

Sometimes change in one variable is not related to change in another variable then we say that there is no relation.

For example- height of student and his examination score.

2. Merits and demerits of scatter diagram

In order to ritual eyes the correlation between two variables the first step is scattered diagram the scatter diagram method is the simplest method to study the correlation between two variables hair in the values for each spare offer variable is plotter don graph in the form of dots as number of observation.

Merits

1. Simplest method of studying correlation.
2. Easy to understand.
3. It is not influenced by extreme values.

Demerits

1. It does not give numerical Major of correlation.
2. It is subjective method.
3. It cannot be applied to qualitative data.

3. Covariance

The drawbacks of scatter diagram as a measure of correlation can be overcome by covariance. The covariance is the joint mutual variation between 2 variables.

4. Properties of correlation coefficient

1. Correlation coefficient lies between -1 and 1
2. Correlation coefficient does not change due to change of origin. Another word if a constant value is added or subtracted from each observation correlation coefficient remains same
3. Correlation remains numerically same under the change of scale. Another word if we divide or multiply by each observation by constant value correlation remains same numerically
4. Correlation coefficient between X and y is same as that of between y and x

5. Properties of regression coefficient

Regression

In the method of estimating the value of one variable when that of the other is known and when the variable are correlated.

Properties of Regression Coefficient

1. Correlation coefficient and regression coefficient have same algebraic signs
2. Correlation coefficient is a square root of product of regression coefficient
3. Both regression coefficients cannot exceeds unity simultaneously
4. Correlation coefficient lies between two regression coefficients

5. Regressions coefficients remain unchanged due to change of origin.
6. Regression coefficient are equal if $\sigma X = \sigma Y$.

6. Important terms

1. **Bivariate data**-in order to determine correlation we require data regarding to concern variables these data are called as bivariate data
2. **Correlation**-the extent of linear relation between the two variables is called as correlation
3. **Covariance**-the drawbacks of scatter diagram as a measure of correlation can be overcome by ovaries the cover as is the joint mutual variation between two variables
4. **Regression**- It is the method of estimating the value of one variable when that of the other is known and when the variable are correlated
- 5.

CHAPTER 4TH INDEX NUMBERS

1. Problems or consideration in the construction of index numbers

Index number is a number designated to measure the average change in the values of a group of related variables over two different situations.

1. Purpose of index numbers-

The purpose for which the index number is constructed should be clearly and unambiguously mentioned similarly the scope of index number should also be defined clearly.

2. Selection of commodities-

Selection of commodities is an important factor in the construction of index numbers there are no rigid rules regarding selection of commodities number of commodities should not be too large or too small.

3. Collection of data-

Data maybe price quotations or quantity consumed or quantity produced or quantity imported extra depending upon the purpose of index numbers the data should be collected from reliable agencies for standard trade journals for periodical reports for official publication etc. the data collected should be accurate and proper representative.

4. Choice of base period-

Index number uses two time periods in this situation A period for which index number is determined is called as current period and the period of comparison or with respect to which index number is determined is called as base period.

5. Selection of type of average-

It is stated above that the index number is a average change in the prices or quantities in order to combine the data we need to use appropriate measure of Central tendency.

6. Selection of weights-

Weighted average is more appropriate than simple average weight is a device of giving duty or proper importance to the commodity if are not attached all commodities and are regarded equally important.

2. Types of index numbers

1. Price index numbers-

Price index numbers are computed to measure the relative changes in prices of group of commodities or single commodity. Government of India regularly computes 2 series of price index numbers.

2. Quantity index numbers-

Quantity index numbers are constructed to measure the changes in volume of industrial production agricultural production mineral production import export etc.

3. Values index numbers-

It is calculated by price and quantity. It is find out changes in values.

3. Uses and limitations of index numbers

A) Uses of index numbers

1. Index number as an economic barometer-

Index numbers are useful in measuring the changes in price production import export stock market etc. cost of inflation index number helps us to know the appreciation of assets

2. Index number help in comparison-

Index number helps in comparing the economic and business activities for two different locations or periods or countries

3. Index number helps in planning and policy making-

Index numbers give the basis for planning it helps in policy making for example investment in stock market

4. Index number helps in finding real income or purchasing power of money

B) Limitations of index numbers

1. Sampling error-

The data used to construct an index number is obtained by method of sampling therefore index numbers are subject to sampling errors

2. Subjectivity in base year-

Index number require base to be a normal period but a person may choose a le base period which is suitable for him there may be a subjectivity in selection of base period

3. Limited scope-

Scope of index number is limited to its purpose for example consumer price index number for urban area cannot be used for rural area.

4. Methods of construction of cost of living index numbers

Cost of living index number or consumer price index number is a number which measures the average change in the retail price paid by a particular class of people at a particular place for a basket of specified commodities and services over two different time periods

1. Aggregate expenditure method-

This formula uses the quantities of various commodities consumed in base period as weights with these weights. Total expenditure on commodities for base period and current period are calculated

2. Family budget method-

This method uses expenditures in base period as weights hence this method is also referred as weighted average of price relatives by means of family budget enquiry commodity wise total expenditure is determined we denote it by w .