TDC (CBCS) Even Semester Exam., 2024

STATISTICS

(6th Semester)

Course No. : STSDSE–601T

Full Marks : 50
Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Candidates have to answer *either* from Option—A
or Option—B

OPTION—A

Course No. : STSDSE–601T (A)

(Econometrics)

UNIT—I

1. Answer any *three* of the following questions :

   $1 \times 3 = 3$

   (a) What is cross-sectional data?

   (b) If $E(\hat{\beta}) = \beta$, then the estimator $\hat{\beta}$ is an
   _____ estimator of β.

   (Fill in the blank)

(2)

(c) The value of R^2 lies between _____ and _____.

(Fill in the blank)

(d) If $E(u_i u_j) = 0$, then there is _____.

(Fill in the blank)

2. Answer any *one* of the following questions : 2

(a) What is the difference between stochastic and non-stochastic relations?

(b) Write down the assumptions of linear regression model.

3. Answer any *one* of the following questions : 5

(a) For the linear regression model $Y = X\beta + U$, where $Y = (Y_1, Y_2, ..., Y_n)'$

$$X = \begin{bmatrix} 1 & X_{11} & X_{21} & ... & X_{k1} \\ 1 & X_{12} & X_{22} & ... & X_{K2} \\ ... & & & & \\ 1 & X_{1n} & X_{2n} & ... & X_{kn} \end{bmatrix}$$

$\beta = (\beta_1, \beta_2, ..., \beta_k)'$, $u = (u_1, u_2, ..., u_n)'$ estimate the parameter β.

(b) Explain the difference between econometrics and mathematical economics.

(3)

UNIT—II

4. Answer any *three* of the following questions : 1×3=3

(a) Define multicollinearity.

(b) Write the name of a test, which is used to detect the multicollinearity.

(c) Define multiple linear regression.

(d) In a multiple linear regression

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$$

β_0 is called _____.

(Fill in the blank)

5. Answer any *one* of the following questions : 2

(a) For the linear regression model $Y_i = \alpha + \beta X_i + u_i$, prove that $E(\hat{\beta}) = \beta$, where $\hat{\beta}$ is the least square estimator of β.

(b) Explain coefficient of determination.

6. Answer any *one* of the following questions : 5

(a) From 16 pairs of observations of X and Y, we have

$$\Sigma y^2 = 526, \ \Sigma x^2 = 657, \ \Sigma xy = 492,$$
$$\Sigma x = 96, \ \Sigma y = 63$$

Estimate the parameters in the model

$$y = \alpha + \beta x + e$$

(b) Describe a test for the detection of autocorrelation.

UNIT—III

7. Answer any *three* of the following questions :

1×3=3

(a) State Gauss-Markov theorem.

(b) Least square estimators are _____.

(Fill in the blank)

(c) Write the name of a test, used to detect the heteroscedasticity problem.

(d) Define Aitken estimator.

8. Answer any *one* of the following questions : 2

(a) State the formula of the statistic used to test the significance of the regression coefficient.

(b) State the reasons for the occurrence of multicollinearity.

9. Answer any *one* of the following questions : 5

(a) Discuss the causes and consequences of autocorrelation.

(b) Obtain the mean and variance of the first-order autocorrelation model.

UNIT—IV

10. Answer any *three* of the following questions :

1×3=3

(a) What do you mean by error due to aggregation?

(b) What is applied econometrics?

(c) For the linear regression model with one explanatory variable, what are the structural form and basic form?

(d) What is homoscedasticity?

11. Answer any *one* of the following questions : 2

(a) Write the effects of autocorrelation on OLS estimators.

(b) Write the normal equation of a regression model with one explanatory variable.

12. Answer any *one* of the following questions : 5

(a) Write a brief note on the general linear regression model.

(b) Describe the consequences of multi-collinearity.

UNIT—V

13. Answer any *three* of the following questions :

    1×3=3

    (a) Write the equation of ARMA (1, 1) model.

    (b) Under Gauss-Markov assumption, the $E(\hat{\sigma}^2) = \underline{\quad\quad}$.

    (Fill in the blank)

    (c) State two problems that may arise if the assumption of homoscedasticity is violated.

    (d) Write the names of a test, used to detect the autocorrelation.

14. Answer any *one* of the following questions : 2

    (a) What is a dummy variable? Write the other name of dummy variable.

    (b) Discuss the types of heteroscedasticity.

15. Answer any *one* of the following questions : 5

    (a) Write in brief the purposes of Aitken estimator.

    (b) Explain the uses of dummy variable.

OPTION—B

Course No. : STSDSE–601T (B)

(Index Numbers and Time Series Analysis)

UNIT—I

1. Fill in the blanks/Answer the following (any *three*) : 1×3=3

    (a) Index numbers are known as _____.

    (b) Define index numbers.

    (c) Write the formula of any weighted price index number.

    (d) Paasche's index is also called as _____.

2. Answer any *one* question : 2

    (a) Describe Marshall-Edgeworth index number.

    (b) Describe unweighted aggregate method of calculation of index number.

3. Answer the following : 5

    Either

    (a) Prove that Marshall-Edgeworth index number lies between Laspeyre's and Paasche's index numbers.

Or

(b) Prove that Fisher's ideal index number lies between Laspeyre's and Paasche's index number.

UNIT—II

4. Fill in the blanks/Answer the following (any *three*) :   1×3=3

(a) Consumer price index number is also known as ____.

(b) Fisher's index number does not satisfy the ____ test.

(c) What is a chain index?

(d) Mention one use of consumer price index number.

5. Answer any *one* question :   2

(a) Explain the chain-base and fixed-base method in constructing an index number.

(b) Explain time reversal test for index number.

6. Answer the following :   5

Either

(a) Show that Fisher's ideal index number satisfies both time reversal test and factor reversal test.

Or

(b) Explain the main steps involved in the construction of consumer's price index numbers.

UNIT—III

7. Fill in the blanks/Answer the following (any *three*) :   1×3=3

(a) What is meant by a time series?

(b) In cyclical fluctuation, the length of the period is ____.

(c) ____ model is the most frequently used mathematical model in time series.

(d) Mention one use of time series.

8. Answer any *one* question :   2

(a) Explain what is meant by seasonal fluctuations of a time series.

(b) Discuss irregular variation in the context of time series.

9. Answer the following : 5

Either

(a) What are the important mathematical models used in time series? Explain them.

Or

(b) Describe with example the components of a time series.

UNIT—IV

10. Fill in the blanks/Answer the following (any *three*) : 1×3=3

(a) Moving average removes _____ and _____.

(b) Write one advantage of semi-average method of measuring trend.

(c) Mention one drawback of trend fitting by the principle of least square.

(d) Which component of time series is associated with the population growth of India?

11. Answer any *one* question : 2

(a) What are the merits and demerits of semi-average method?

(b) Write a short note on graphical method of measuring trend.

12. Answer the following : 5

Either

(a) Explain the procedure of fitting a second degree trend equation.

Or

(b) Explain in brief the method of moving average for the determination of trend.

UNIT—V

13. Fill in the blanks/Answer the following (any *three*) : 1×3=3

(a) Link relatives for calculating seasonal indices are converted into _____.

(b) Mention one merit of ratio to trend method.

(c) Simple average method for finding out seasonal indices is good when _____.

(d) Which method of measuring seasonal variations is the most widely used?

14. Answer any *one* question : 2

(a) What are the merits and demerits of ratio to moving average method?

(b) Explain the necessity of studying seasonal effects in a time series.

15. Answer the following : 5

Either

(a) Explain the ratio to moving average method of computing the indices of seasonal variations.

Or

(b) Explain the link relative method of computing the indices of seasonal variation.

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