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STATISTICS

( Major )

Paper : 5.3

( Applied Statistics-I )

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following questions as directed :

1×7=7

(a) In the linear model  $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + U$  if  $X_1$  and  $X_2$  are correlated, then a problem is faced while estimating the parameters by least square method. What is the name of the problem?

(b) If  $E(U_i U_j) = 0$  for  $i \neq j$ ;  $\forall i, j$  in the linear model  $Y_i = \alpha + \beta X_i + U_i$ , then the disturbance values are known as \_\_\_\_\_.

( Fill in the blank )

(c) If  $E(U_i U_j) = \sigma_u^2$  for  $i = j \forall i, j$  in the linear model  $Y_i = \alpha + \beta X_i + U_i$ , then the disturbance terms are known as \_\_\_\_\_.

( Fill in the blank )

(d) When two variables are said to be heteroscedastic?

(e) What is the main difference between seasonal and cyclical variations in a time series analysis?

(f) CLIN = 117.75. Interpret the result.

(g) Define price elasticity of demand.

2. Answer the following questions : 2×4=8

(a) Show graphically how market price of a consumer good is determined and settled.

(b) Write two estimators for unknown disturbance variance  $\sigma_u^2$  in the linear model  $Y_i = \alpha + \beta X_i + U_i$ ;  $i = 1, 2, \dots, n$ . Which one will be unbiased?

(c) Write four limitations of index numbers.

(d) Explain irregular movements in a time series.

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

5×3=15

(a) Write an explanatory note on coefficient of determination  $r^2$  in connection to goodness of fit of a linear model. 5

(b) What are the main problems in a time series analysis? Explain the models commonly used for decomposition of a time series. 2+3=5

(c) Explain the method of semi-averages for measurement of trend in a time series. 5

(d) Discuss the types of averages to be used in the construction of index numbers with their merits and limitations. 5

(e) Define price elasticity of demand. If the demand function is

$$D = 4 - 5P^2$$

for what value of  $P$  the elasticity of demand will be unitary? 2+3=5

4. (a) Explain the simple linear model with underlying assumptions. Estimate the parameters of such a model. How would you estimate the unknown error variance  $\sigma_u^2$  in the model? 4+3+3=10

Or

(b) Prove that ordinary least square estimators are best, linear and unbiased estimators. 10

5. (a) Show that Laspeyres' and Paasche's index numbers do not satisfy two tests of consistency of index numbers. 10

Or

(b) State Engel's law. Give various forms of Engel's curve and find their income elasticities. 2+8=10

6. (a) Discuss any two methods of obtaining measures of seasonal variation. Discuss their relative merits and demerits. 10

Or

(b) Write short notes on any *two* of the following : 5×2=10

(i) Pareto's law of income distribution

(ii) Multicollinearity

(iii) Autocorrelation

(iv) Errors in index numbers

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