

**2020**

**STATISTICS — GENERAL**

**Paper : DSE-A-1**

**(Econometrics)**

**Full Marks : 50**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Day 3**

1. Answer **any ten** from the following : 1×10
- (a) In a multiple regression model, the value of  $R^2$  is found to be 0.73. How is it interpreted?
  - (b) What is a residual?
  - (c) Is multicollinearity a data problem or a model problem?
  - (d) Mention any one reason for the occurrence of serial correlation.
  - (e) Mention a method of overcoming multicollinearity.
  - (f) Is there any test to detect the presence of errors in variables?
  - (g) What is meant by an instrumental variable?
  - (h) What are the consequences of auto-correlation on the ordinary least squares (OLS) estimators of parameters?
  - (i) What is meant by dummy variable?
  - (j) Mention the primary sources of multicollinearity.
  - (k) Justify or correct the statement : ‘An example of a perfect collinear relationship is a quadratic or cubic function’.
  - (l) Write ‘True’ or ‘False’ : ‘Heteroscedasticity is more likely a problem of cross-section data’.
  - (m) What is heteroscedasticity?
  - (n) How can we take care of measurement errors in the dependent variable?
  - (o) Write down a plausible approach of dealing with residual auto-correlation.
2. Answer **any four** from the following : 5×4
- (a) Explain briefly the reason for insertion of random disturbance term in an econometric model.
  - (b) What do you mean by econometrics? How econometrics can be used as a tool for forecasting and prediction?

**Please Turn Over**

- (c) What is meant by multicollinearity? Indicate its consequences.
- (d) What is meant by errors in variables? What problems do errors in variables create?
- (e) Define auto-correlation. What assumptions of the classical linear regression model will not hold if there is a problem of auto-correlation?
- (f) What are the possible reasons for the emergence of heteroscedasticity? Why is heteroscedasticity a problem?

3. Answer **any two** from the following :

- (a) Explain the method of generalized least squares to obtain the estimators of a linear model in the presence of heteroscedasticity. 10

- (b) Consider a simple linear regression model

$$y_t = \beta_1 + \beta_2 x_t + u_t, \quad t = 1, 2, \dots, n.$$

Assume that  $u_t = \rho u_{t-1} + \epsilon_t$ ,  $|\rho| < 1$ ,  $t = 1, 2, \dots, n$ .

Find the generalized least squares estimates of  $\beta_1$  and  $\beta_2$  when  $\rho$  is known. 10

- (c) Explain the effects of heteroscedasticity on the estimates of the parameters and their variances in a linear model. Briefly discuss a test for detecting the problem of heteroscedasticity. 5+5
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