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14 (ECO-3) 3016

2023

**ECONOMICS**

Paper : ECO-3016

Full Marks : 80

Time : Three hours

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

1. Answer the following : 5×4=20

(a) In the Linear Regression Model  $Y = a + bX + cG + U$ ,  $Y$  is farm income per hectare,  $X$  is labour input per hectare and  $G$  is a dummy which takes the values 1 if the farmer is male and 0 otherwise. Give interpretations of  $b$  and  $c$ . 2+3=5

(b) In the general linear regression model  $y = X\beta + u$ , suppose  $E(u) = 0$  but  $E(uu')$  is not  $\sigma^2 I$ . Show that OLS estimators of  $\beta$  is still unbiased, but OLS inference process is invalid. 2+3=5

Contd.

(c) In a time series  $X_t = pX_{t-1} + \varepsilon_t$ , show that mean value of the series  $X_t$ , is time invariant. Graph the time series when  $|p| < 1$  and  $p = 1$ . 3+2=5

(d) What is simultaneity bias ? Why does it arise in estimation of simultaneous equation models ? Give reasons. 2+3=5

2. Answer **any three** of the following : 10×3=30

(a) Given the OLS estimators of the Classical Linear Regression Model  $Y = \beta_1 + \beta_2 X_2 + \dots + \beta_k X_k + U$ , explain the problems you will encounter in inferring which  $X$  variables have significant impact on  $Y$ . How would you resolve the problems ? 6+4=10

(b) Define the Coefficient of Determination and give interpretation of its value. What kind of problem may you anticipate with the coefficient if you are working with a large cross-section sample? Discuss in this context the relevance of the test of overall significance of the regression. 4+2+4=10

- (c) Based on economic theory a researcher fits the following model :

$$\text{Consumption}_i = B_1 + B_2 \text{ Income}_i + B_3 \text{ Wealth}_i + u_i.$$

There is a possibility that both the *two* independent variables are highly related to each other. If yes, what may be the problem that the model may suffer? How does the researcher know about such problem? Explain *two* remedial measures of it. 2+4+4=10

- (d) What does stationarity of time series mean? What is weakly stationarity of a time series? Show that  $X_t = pX_{t-1} + \varepsilon_t$ , is weakly stationary if  $|p| < 1$  but doesn't if  $p = 1$ . 4+2+4=10

- (e) What is the precondition of applying Indirect Least Square method to estimate an equation of a simultaneous equation model? Outline the estimation procedure of the Indirect Least Square method using the following simultaneous equation model where  $Q_t^d$  and  $Q_t^s$  represent demand and supply quantities respectively,  $P_t$  is price,  $Y_t$  is income,  $u_t$  and  $v_t$  are the random disturbances :

$$Q_t^d = a + bP_t + cY_t + u_t$$

$$Q_t^s = d + eP_t + v_t$$

2+8=10

3. Answer *any two* of the following :  $15 \times 2 = 30$

(a) Specify the Classical Linear Regression model with its associated assumptions. Derive the OLS estimators of the regression coefficients. Indicate how you would proceed to estimate the variance of the disturbance term.  $4+8+3=15$

(b) Illustrate how the OLS estimate of linear regression model is used for generating point and interval predictions of the dependent variable. Show that the interval predicted will be the narrowest when value of the independent variable for the prediction unit is equal to its sample mean.  $10+5=15$

(c) Random Walk Model is an example of a non-stationary time series. Why? Discuss. Explain how the correlogram and unit root test can be used to check the stationarity of a time series.

$7+4+4=15$