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63/1 (Sem-4) CC10/ECOHC4106

2024

**ECONOMICS**

Paper : ECOHC4106

**(Introductory Econometrics)**

Full Marks : 80

Pass Marks : 32

Time : Three hours

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

1. Choose the correct answer from the following  
**(any six):** 1×6=6
- (a) What is the shape of a normal distribution curve?
- (i) Bell-shaped
  - (ii) Skewed
  - (iii) U-Shaped
  - (iv) Rectangular

(b) Rejecting a true hypothesis results in which type of error?

- (i) Type-I error
- (ii) Type-II error
- (iii) Structural error
- (iv) Hypothesis error

(c) Under the assumption of the Gauss-Markov theorem, the errors of a linear regression model need to be

- (i) homoscedastic
- (ii) identically distributed
- (iii) zero
- (iv) normally distributed

(d) What is the maximum value of coefficient of determination  $R^2$ ?

- (i) 1
- (ii) -1
- (iii) 0
- (iv) Infinity

(e) If the slope of the regression equation  $Y = b_0 + b_1X$  is positive, then

- (i) as  $X$  increases  $Y$  decreases
- (ii) as  $X$  increases so does  $Y$
- (iii) Either (i) or (ii) correct
- (iv) as  $X$  decreases  $Y$  increases

(f) What type of data is typically analysed using the chi square test?

- (i) Continuous data
- (ii) Categorical data
- (iii) Ordinal data
- (iv) Ratio data

(g) In OLS estimation what is minimized to find the best line?

- (i) Variance
- (ii) Mean
- (iii) Sum of squared residual
- (iv) Mean of absolute error

- (h) In a normal distribution approximately what percentage of the data falls within one standard deviation from the mean?
- (i) 25%
  - (ii) 50%
  - (iii) 68%
  - (iv) 95%
- (i) What does degree of freedom (df) represent in the 't' distribution?
- (i) The number of samples in the population
  - (ii) The number of parameters estimated from the sample
  - (iii) The number of standard deviation from the mean
  - (iv) The sample size minus one
- (j) What is the purpose of using dummy variables in regression analysis?
- (i) To convert continuous variable into categorical variable
  - (ii) To increase the number of predictor in the model
  - (iii) The reduce multicollinearity among predictor
  - (iv) To simplify the interpretation of categorical variables

2. Answer the following questions (**any five**) :  
2×5=10

- (a) What is the level of significance in hypothesis testing?
- (b) What are the mean and standard deviation in a normal distribution?
- (c) How is a population parameter different from a sample statistics?
- (d) Define goodness of fit.
- (e) When does type-II error occur in hypothesis testing?
- (f) What is the main difference between the 't' distribution and the normal distribution?
- (g) Define the term 'homoscedasticity' in the context of OLS regression.

3. Answer the following questions (**any six**) :  
5×6=30

- (a) Define econometrics and explain its significance in understanding economic phenomena.
- (b) How do time series data play a role in forecasting?

- (c) How does sample size affect the width of a confidence interval?
- (d) State the application of  $F$ -distribution.
- (e) Define Ordinary Least Squares (OLS) regression. State the role of the error term in OLS regression.
- (f) Write a short note on multicollinearity.
- (g) Distinguish between Type-I and Type-II errors in statistical hypothesis testing.
- (h) Mention the assumptions underlying the chi-square test and potential consequences of violating these assumptions.
- (i) Compare  $R^2$  and adjusted  $R^2$  in terms of their interpretation and use in assessing the goodness of fit.
- (j) Discuss why dummy variables are necessary when dealing with categorical predictors in regression models.

4. Answer the following questions (**any two**):  
10×2=20

- (a) The distribution of monthly income of 500 workers may be assumed to be normal with mean deviation of Rs. 2,000 and standard deviation of Rs. 200. Estimate the number of workers with incomes—
- (i) Exceeding Rs. 2,300 per month.
- (ii) Between Rs. 1,800 and Rs. 2,300 per month.
- [Given  $Z = 0.67 \quad 1.00 \quad 1.50$   
Area = 0.25 0.3413 0.4322]
- (b) The manufacturer of a certain type of bulbs have a mean life of 25 months with a standard deviation of 5 months. A random sample of 6 such bulbs gave the following values :
- Life in months : 24, 26, 30, 20, 20, 18
- Can you regard the producer's claim to be valid at 1% level of significance? (Given the table value of ' $t$ ' at 1% level of significance is 4.032)
- (c) Define hypothesis testing and explain its importance in the field of research. Outline the steps involved in hypothesis testing.

- (d) Define simple linear regression and explain its assumptions. How do you interpret the slope and intercept co-efficient in a simple linear regression equation? 2+3+5=10

5. Answer the following questions (**any one**) : 14

- (a) Explain the conditions under which the ordinary least squares (OLS) estimators are best, linear unbiased estimators (BLUE) according to the Gauss-Markov theorem.
- (b) Explain the concept of the residual sum of squares. How is it minimized in OLS estimation ?
- (c) In an Antimalarial campaign in India, Quinine medicine was administered to 500 persons out of a total population of 2000. The number of favoured cases is shown below :

Treatment	Fever	No fever	Total
Quinine	20	480	500
No Quinine	100	1400	1500
Total	120	1880	2000

Discuss the usefulness of Quinine in checking malaria.

(Give  $\chi^2$  0.05 for 1 df = 3.841)