Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MMA/SEM-2/MMA-208/2010

2010

STATISTICAL & ECONOMETRIC METHODS – II

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

   i) In regression analysis we are concerned with the study of

      a) Mean value of the X population

      b) Mean value of the Y population

      c) Dependence of Y variable on one or more explanatory variables

      d) Interdependence of X variable and Y variable.

   ii) Coefficient of determination measures

      a) the correlation between X and Y

      b) fit of the functional form

      c) the residual sum of squares as a proportion of total sum of squares

      d) the explained sum of squares as a proportion of total sum of squares.

iii) In a two-variable linear regression model the slope coefficient measures

a) the mean value of the Y

b) the change in Y which the model predicts for a unit change in X

c) the value of Y for a given value of X

d) all of these.

iv) When the estimated slope coefficient in the simple regression model is zero then

a) $R^2 = Y$ b) $0 < R^2 < 1$

c) $R^2 = 0$ d) $R^2 > RSS/TSS$.

v) There are several reasons why serial correlation occurs. One reason that does cause serial correlation is

a) most time series data exhibit business cycles

b) researchers may have excluded the some important variable from the regression

c) some variables react with a lag

d) large variation exist in the observed X variables.

vi) Heteroscedasticity means that

a) all X variables cannot be assumed to be homogeneous

b) the variance of the error term is not constant

c) the observed units have no correlation

d) X and Y are not correlated.

vii) Multicollinearity from the model can be removed by

a) obtaining additional or new data

b) drop variables that cause multicollinearity in the first place

c) transforming data

d) all of these.

viii) With the violation of the assumption of homoscedasticity the estimates of the regression function will still be all of the following *except*

a) unbiased

b) linear

c) asymptotically normally distributed

d) efficient.

ix) Type 1 Error occurs when

a) accepting a Null hypothesis when it is false

b) rejecting a Null hypothesis when it is false

c) rejecting a Null hypothesis when it is really true

d) rejecting a Null hypothesis when it is true.

x) If the two regression lines are given by $x + 6y = 6$ and $3x + 2y = 10$, then r^2 is given by

a) 2 b) 4

c) $-1/3$ d) 6.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Discuss the methodology of econometrics giving a suitable example.

3. State the properties of OLS estimators.

4. The following table shows the ages, X and the blood pressures, Y of 12 women :

Age (X)	56	42	72	36	63	47	55	49	38	42	68	60
Blood pressure (Y)	147	125	160	118	149	128	150	145	115	140	152	155

Using the OLS technique find the regression equation of Y on X.

5. What is interval estimation ? How is it different from point estimation ?

6. "The simple regression line of Y on X coincides with that of X on Y if and only if r^2 is 1". Explain whether this statement is true or false.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) State the assumptions of a classical Linear Regression Model.

b) The following data relate to marketing expenditure in Rs. lac and corresponding sales of a product in Rs. (Crores) :

Marketing expenditures	10	12	15	20	23
Product sales	14	17	23	21	25

i) Estimate the marketing expenditure to attain a sales target of Rs. 40 crores.

ii) Find the correlation coefficient between marketing expenditure and product sales. 5 + 5 + 5

8. Show that Total Sum of Squares = Explained Sum of Squares + Residual Sum of Squares

Consider the following estimated regression equation :

$Y_i = a + 1{\cdot}5\,X_i + e_i$, with estimated standard error of β coefficient is 0·5. It is further given that $r^2 = 0{\cdot}5$ X (bar) = 10 and Y (bar) = 25 and $\Sigma Y_i^2 = 6895$.

Find out the following :

i) Total number of observations (n)

ii) The estimated intercept coefficient (α)

iii) Total Sum of Squares (TSS)

iv) Residual Sum of Squares (RSS). 6 + 2 + 2 + 3 + 2

9. a) Explain the concept of multiple regression with suitable examples.

b) The following table shows the weights (X_1) in pounds, the heights (X_2) in inches and the ages (X_3) in years of 12 boys :

Weight (X_1)	64	71	53	67	55	58	77	57	56	51	76	68
Height (X_2)	57	59	49	62	51	50	55	48	52	42	61	57
Age (X_3)	8	10	6	11	8	7	10	9	10	6	12	9

i) Find the least squares regression equation of (X_1) on (X_2) and (X_3).

ii) Estimate the weight of the boy who is 9 years old and 54 inches tall. 5 + 10

10. Show that in a Classical Linear Regression model the estimated regression coefficients are unbiased.

Suppose Mr. *A* estimates a consumption function and obtain the following results :

$C = 15 + 0{\cdot}81\ Y_d, \qquad n = 19$

$(3{\cdot}1)\ (18{\cdot}7) \qquad R^2 = 0{\cdot}99$

C denotes the estimated consumption function, Y_d, the Disposable income, the numbers in the parentheses are the *t* ratios.

a) Test the significance of Y_d using the *t* ratios.

b) Determine the estimated standard deviations of the estimator parameters.

c) Construct a 95% confidence interval for the coefficient of Y_d.

Given $t_{0{\cdot}025,17} = 2{\cdot}110$. 8 + 3 + 2 + 2

11. a) What is meant by Heteroscedasticity ? Show that the OLS estimators will be unbiased even if there is a problem of Heteroscedasticity.

b) Define auto-correlation. What assumptions of CLRM will not hold if there is a problem of auto-correlation ? 8 + 7