

GOALPARA COLLEGE

Total number of printed pages-4

3 (Sem-6/CBCS) STA HE 1

2023

STATISTICS

(Honours Elective)

Paper : STA-HE-6016

(Econometrics)

Full Marks : 60

Time : Three hours

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

1. Answer the following questions as directed : 1×7=7

(a) The regression model is linear in the parameters. (Write True **or** False)

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

Contd.

- (c) What do you understand by BLUE ?
- (d) Homoscedasticity refers to the error terms having
- (i) zero mean
 - (ii) positive variance
 - (iii) constant variance
 - (iv) positive mean
- (Choose the correct option)

(e) Data collected at a point in time is called _____. (Fill in the blank)

- (f) In $Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{U}_i$, \hat{U}_i gives the differences between
- (i) the actual and estimated Y values
 - (ii) the actual and estimated X values
 - (iii) the actual and estimated beta values
 - (iv) the actual and estimated U values
- (Choose the correct option)

(g) For coefficient of determination r^2 for a regression model $0 \leq r^2 \leq 1$.
(Write True or False)

2. Answer the following questions : $2 \times 4 = 8$

- (a) What do you understand by 'econometrics'?
- (b) Define time series data.
- (c) Write the objectives of econometrics.
- (d) What is the significance of b_{yx} the regression coefficient of Y on X ?

3. Answer **any three** from the following questions : $5 \times 3 = 15$

- (a) Write a note on coefficient of determination r^2 .
- (b) Write the assumptions in the three variable regression model
 $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + U_i$.
- (c) Write a note on the scope of econometrics.
- (d) Discuss the linear model used in econometrics.
- (e) Write a note on autocorrelation.

4. (a) Estimate the parameters of the linear model $Y = \alpha + \beta X + U$. Show that $E(\hat{\alpha}) = \alpha$, $E(\hat{\beta}) = \beta$ where $\hat{\alpha}$ and $\hat{\beta}$ are least square estimators for α and β . Also find standard errors of $\hat{\alpha}$ and $\hat{\beta}$.
3+3+4=10

Or

- (b) State and prove Gauss-Markov theorem. 10
5. (a) Discuss the properties of least square estimators. 10

Or

- (b) Discuss the limitations of econometrics. Also describe the methodology involved in an econometric model. 5+5=10
6. (a) Write short notes on : 5×2=10
(i) Multicollinearity
(ii) Heteroscedasticity

Or

Write a note on hypothesis testing. Explain how you would construct 95% confidence intervals for the parameters α and β in the simple linear model $Y = \alpha + \beta X + U$.
4+3+3=10

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3 (Sem-6/CBCS) STA HE 2

2023

STATISTICS

(Honours Elective)

Paper : STA-HE-6026

(Demography and Vital Statistics)

Full Marks : 60

Time : Three hours

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

1. Answer the following questions as directed :

1×7=7

(a) The death rate obtained for a segment of a population is known as

- (i) crude death rate
- (ii) specific death rate
- (iii) standard death rate
- (iv) foetal death rate

(Choose the correct option)

Contd.

- (b) Define cohort.
- (c) Vital statistics rate are generally expressed as
- (i) fraction of population
 - (ii) per hundred of population
 - (iii) per thousand population
 - (iv) None of the above

(Choose the correct option)

- (d) There is no relationship between gross reproduction rate and net reproduction rate.

(Write true or false)

- (e) If P_1 and P_2 are the population in two successive censuses, the mid period population is equal to _____.

(Fill in the blank)

- (f) The ratio of the number of children of age less than five years to the total number of women of 15-49 years of age is called

- (i) net reproduction rate
- (ii) vital index
- (iii) gross reproduction rate
- (iv) replacement index

(Choose the correct option)

- (g) A population maintaining a constant growth rate is said to be a stationary population.

(Write true or false)

2. Answer the following questions : $2 \times 4 = 8$

- (a) How can you calculate the specific death rate for a specific section of the population ?
- (b) On what factors do the crude birth rate and crude death rate mainly depend ?
- (c) What is meant by vital index of population and how can it be measured ?

(d) Discuss the rates and ratios of vital events.

3. Answer **any three** questions from the following : $5 \times 3 = 15$

(a) What are vital statistics? Describe the use of vital statistics. $2+3=5$

(b) Explain why TFR, GRR and NRR are regarded as hypothetical figures.

(c) Show that an approximate value of force of mortality is

$$\frac{\{8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})\}}{12l_x}$$

(d) What is meant by the statement "NRR of a country is 1.201"? Show that for any community, the NRR is necessarily less than the GRR. Can they be looked upon as indices of population growth?

$$1+3+1=5$$

(e) Prove that

$$(i) \quad l_x = \sum_{i=x}^{w-1} di \quad \text{if } l_w = 0$$

$$(ii) \quad T_x = \frac{1}{2}l_x + \sum_{t=1}^{\infty} l_{x+t} \quad 2+3=5$$

4. Answer the following questions : $10 \times 3 = 30$

(a) Describe three measures which are in use for determination the fertility trend in a population and discuss their utility as indices of population growth.

$$6+4=10$$

Or

Explain why the mortality situation of two places should not be compared on the basis of 'crude death rate'. Describe the construction of 'standardised death ratio' and indicate why they are considered to be better for the said comparison.

$$4+(4+2)=10$$

(b) Define force of mortality and central mortality rate in a life table. Show that with usual notation

$$(i) \quad m_x = \frac{2q_x}{2 - q_x}$$

$$(ii) \quad \mu_x + \frac{1}{2} = m_x \quad (2+2)+(3+3)=10$$

Or

Give the concept of a life table. On what assumption or factors is the construction of life table based? Explain how different columns of a life table may be computed on the basis of observed age-specific death rates.

$$1+4+5=10$$

- (c) (i) Is it true that when the expectation of life is 67 years then the expectation of life of a person aged 65 years is 2 years?

Discuss the concept of expectation of life with a view to throwing light on this.

5

- (ii) Show that, with usual notation

$$e_x = \frac{\left(\sum_{n=1}^{\infty} l_{x+n} \right)}{l_x}$$

5

Or

Write notes on the following :

$$3+4+3=10$$

- (i) Infant mortality rate with its advantages and drawbacks
(ii) Demographic balancing equation
(iii) Stationary and stable population