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6 SEM TDC STS M 2 (N/O)

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(May)

STATISTICS

(Major)

Course : 602

(Applied Statistics)

(New Course)

Full Marks : 80

Pass Marks : 24

Time : 3 hours

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

Answer any **four** Units

UNIT—1

(Time Series)

1. Which component of time series is responsible in the following cases? 1+1=2

(a) Passenger traffic during the peak hours of a day

(b) Increase of population of a country

2. Answer any *two* of the following : $3 \times 2 = 6$

(a) How to fit an exponential trend line by the method of least squares?

(b) Explain the method of moving averages for evaluation of trend in a time series.

(c) Write ratio to trend method of finding seasonal fluctuation of a time series.

3. Explain the meaning of cyclical variation of a time series. Discuss the residual method of finding cyclical variation of a time series.

$2 + 4 = 6$

4. (a) Derive Spencer's 21-point formula for determining trend of a time series. 6

Or

(b) What are the different components of a time series? Discuss them with suitable examples.

UNIT—2

(Index Number)

5. Write true or false for the following : $1+1=2$

(a) Marshall-Edgeworth index number lies between Laspeyres' and Paasche's index numbers.

(b) Laspeyres' formula of index number tends to over-estimate the price change.

6. Answer any *two* of the following in brief :

$3 \times 2 = 6$

(a) If $L(p)$ and $P(q)$ represent respectively Laspeyres' price index number and Paasche's quantity index number, show that

$$L(p) P(q) = L(q) P(p)$$

(b) Define cost of living index number. How is it used to determine the purchasing power of money?

(c) Differentiate fixed base and chain-base methods of calculating index numbers.

7. Explain the problems involved in construction of index number. 6
8. (a) What do you mean by tests of an index number? Discuss the different tests for a good index number. 2+4=6
- Or
- (b) Explain the role of index numbers in formulating government policies. 6

UNIT—3

(**Mathematical Economics and Econometrics**)

9. Write true or false for the following : 1+1=2
- (a) If price elasticity of demand lies between 0 and 1, then demand is called elastic demand.
- (b) With the help of a Lorenz curve, one can compare the variability of two or more distributions.
10. Answer any *two* of the following in brief : 3×2=6
- (a) Show that the demand curve with constant price elasticity is a hyperbola.

(b) The price elasticity of demand curve $x = f(p)$ is of the form $(a - bp)$, where a and b are constants. Find the demand curve.

(c) Write a note on econometrics.

11. What are the main sources of data for estimating demand curve? Discuss any one of the methods of estimating demand function. 1+5=6

12. (a) Explain Pareto law of income distribution, pointing out its assumptions, merits and demerits. 6

Or

(b) Find out the OLS estimates of classical linear regression model. Discuss the properties of these estimators.

UNIT—4

(Demography)

13. Fill in the blanks : 1+1=2

(a) In calculating rates of vital events, a multiplier called _____ is used to round-off the decimals.

(b) The relative number of males and females in a population is measured by _____.

14. Answer any *two* of the following in brief :

3×2=6

(a) What are crude birth and crude death rates? On what factors do these rates mainly depend?

(b) Describe the direct method of standardization of death rates.

(c) Interpret the results $NRR < = > 1$.

15. What is a life table? Explain the various columns of a complete life table and the relations between them.

1+5=6

16. (a) What is meant by fertility and how is it measured? Describe age-specific fertility rate (ASFR) and general fertility rate (GFR).

6

Or

(b) Explain the main sources of demographic data in India.

UNIT—5

(Statistical Quality Control)

17. Write true or false for the following : $1+1=2$

(a) C-chart can be used to measure the number of imperfections observed in a bale of cloth.

(b) Consumer's risk = P (rejecting a lot of quality p).

18. Answer any *two* of the following in brief :

$3 \times 2 = 6$

(a) What is meant by process control in industrial statistics?

(b) Discuss the role of control charts in manufacturing process.

(c) Describe single sampling plan.

19. Explain how \bar{X} and R charts are drawn in practice. How would you interpret the points falling outside the control limits on these charts?

$4+2=6$

20. (a) What are average sample number (ASN) and average total inspection (ATI)? Explain the method of their calculation for single sampling plan.

6

Or

- (b) Describe double sampling plan and the general method of plotting OC curve of such a plan.

UNIT—6

(Educational Statistics)

21. Fill in the blanks : 1+1=2

(a) The mean of a set of σ -scores is always _____.

(b) If r_t is the coefficient of reliability of a test, then the range of r_t is _____.

22. Answer any *two* of the following in brief :

3×2=6

(a) Give the concept of a percentile scale.

(b) Write the important properties of parallel tests.

(c) What is the effect of lengthening of a test on validity?

23. What do you understand by a *T*-scale?
Explain clearly the method of converting raw
test scores into *T*-scores. 1+5=6

24. Describe the Kuder-Richardson methods of
assessing the reliability of a test. Discuss its
merits and demerits. 6

Or

What do you understand by intelligence
quotient (IQ)? Describe the procedure and
tests for measuring IQ. 6

(10)

(Old Course)

Full Marks : 80

Pass Marks : 32

Time : 3 hours

1. Choose the correct answer from the given alternatives : 1×8=8

(a) The method of least squares cannot be used for fitting of

(i) exponential curve

(ii) logistic curve

(iii) straight line

(iv) second degree parabola

(b) Sales of a departmental store during the 12 months of a year are the examples of

(i) cyclical fluctuations

(ii) seasonal fluctuations

(iii) secular trend

(iv) irregular fluctuations

- (c) For construction of index numbers, the most appropriate average is
- (i) arithmetic mean
 - (ii) geometric mean
 - (iii) median
 - (iv) None of the above
- (d) Fisher's ideal index number does not satisfy
- (i) unit test
 - (ii) circular test
 - (iii) time-reversal test
 - (iv) factor-reversal test
- (e) Demand for goods having several uses is called
- (i) elastic demand
 - (ii) inelastic demand
 - (iii) less elastic demand
 - (iv) overelastic demand
- (f) Which of the following is not a probability rate of vital events?
- (i) Crude death rate
 - (ii) Crude birth rate
 - (iii) General reproduction rate
 - (iv) None of the above

(g) On which probability distribution the control charts for fraction defective is based?

(i) Binomial distribution

(ii) Normal distribution

(iii) Poisson distribution

(iv) None of the above

(h) The first population Census of whole India was conducted in

(i) 1881

(ii) 1872

(iii) 1901

(iv) 1871

2. (a) Describe the method of moving averages for estimating the trend in time series. Discuss its merits and demerits. 5+4=9

Or

(b) What is trend of a time series? Explain how the principle of least squares is used to estimate trend in a time series.

3+6=9

3. (a) Discuss various problems involved in the construction of index number. 9

Or

- (b) Outline different mathematical tests for an ideal index number. Illustrate these with respect to Fisher's index number.

5+4=9

4. (a) Define income and price elasticity of demand. Describe a method for estimating the elasticity of demand from family budget data.

4+5=9

Or

- (b) Define utility function and marginal utilities for two commodities X_1 and X_2 . Derive the conditions for utility maximization of the utility function $u = f(X_1, X_2)$ subject to the budget constraint $p_1x_1 + p_2x_2 = y$, where x_1 and x_2 are the quantities consumed, p_1 and p_2 are the prices of commodities x_1 and x_2 respectively, and y is the fixed income.

3+6=9

5. (a) Explain crude and standardized death rates. In what way standardized death rate is superior to crude death rate? Give briefly the direct and indirect method of finding standardized death rate.

2+2+5=9

Or

- (b) State the meaning of various columns of a life table and explain how a life table can be constructed from data usually available. Mention the uses of life table.

3+3+3=9

6. (a) Distinguish between defect and defectives. Explain the construction of a control chart for fraction defective. 3+6=9

Or

- (b) Explain briefly the terms (i) specification limits, (ii) tolerance limits and (iii) control limits as used in statistical quality control. Would you recommend the statistical tolerances for production control? Give your reasons.

6+3=9

7. (a) Discuss the present official statistical system in India.

9

Or

- (b) What are the various methods of Census in India? Explain in detail.

8. Write short notes on any *three* of the following : 6×3=18

(a) Process control and production control

(b) Cost of living index number

(c) Secular trend and irregular movements

(d) Specific death rate and age-specific death rate

(e) Functions of NSSO and CSS
