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**6 SEM TDC STS M 2 (N/O)**

**2019**

( May )

STATISTICS

( Major )

Course : 602

**( Applied Statistics )**

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

( New Course )

*Full Marks* : 80
*Pass Marks* : 24

*Time* : 3 hours

Answer *any* **four** Units

UNIT—1

**( Time Series )**

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

*(a)* Bank clearings and bank deposits

*(b)* Increasing tendency of sales of products

**2.** Answer any *two* of the following : 3×2=6

*(a)* Explain how the 'principle of least squares' used to estimate trend in a time series.

*(b)* Discuss the different mathematical models commonly used in the study of a time series.

*(c)* What is meant by 'seasonal variation' in a time series? Illustrate your answer with suitable examples.

**3.** Why are moving averages calculated in analyzing a time series? How is the period of moving average determined? 2+4=6

**4.** *(a)* Derive Spencer's 15-point formula for calculating trend values of a time series. 6

*Or*

*(b)* Explain the additive and multiplicative models of a time series stating clearly the assumptions and discuss their relative merits. 6

UNIT—2

**( Index Number )**

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

*(a)* If Laspeyres' price index is equal to Paasche's price index, then both of these satisfy factor reversal test.

*(b)* Fisher's ideal index formula does not satisfy circular test.

**6.** Answer any *two* of the following in brief : 3×2=6

*(a)* "Index numbers are economic barometer." Explain.

*(b)* Develop Fisher's index and examine its merits and demerits.

*(c)* Explain the importance of using appropriate weights in framing an index number.

**7.** Explain—

*(a)* Time Reversal test

*(b)* Factor Reversal test

*(c)* Circular test

in index number theory. Give examples of index number satisfying one or more of the above tests. 6

8. *(a)* What do you understand by cost of living index numbers? Describe briefly the main steps to be followed in their construction. 6

*Or*

*(b)* Define the following index numbers and discuss their merits and demerits : 6

*(i)* Laspeyres' index number

*(ii)* Paasche's index number

*(iii)* Fisher's ideal index number

UNIT—3

**( Mathematical Economics and Econometrics )**

9. Fill in the blanks : 1×2=2

*(a)* Demand for necessities or conventional necessities is _____.

*(b)* Elasticity of demand varies with changes in _____.

10. Answer any *two* of the following : 3×2=6

*(a)* State the law of demand and define price elasticity of demand.

(b) If the demand function is $p = 4 - 5x^2$, for what value of $x$, the elasticity of demand will be unitary?

(c) Define utility function and marginal utilities for two commodities $X_1$ and $X_2$.

**11.** What are the basic considerations in the determination of demand functions? Explain the use of 'cross section data' in demand analysis. 2+4=6

**12.** (a) Explain income and price elasticities of demand of a commodity $X$ for a consumer and discuss the difficulties which arise while estimating the price elasticity from a time series data. 2+4=6

*Or*

(b) State Pareto's law of income distribution and discuss its limitations. 6

UNIT—4

**( Demography )**

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

(a) Female crude death rate (CDR) is generally _____ male crude death rate.

(b) The data used for constructing a life table are _____ and _____.

**14.** Answer any *two* of the following : 3×2=6

(a) Distinguish between crude death rate and standardised death rate.

(b) Define a life table, a complete life table, an abridged life table and the radix of a life table.

(c) Define 'reproduction rates' and explain how far they may be looked upon as indices of population growth.

**15.** Define and compare various measures of fertility. 6

**16.** (a) Describe the various components of a life table. How is the expectation of life of birth determined from a life table? 6

*Or*

(b) Explain the different sources of vital statistics. 6

UNIT—5

**( Statistical Quality Control )**

**17.** Write true or false for the following : 1×2=2

*(a)* The faults due to assignable causes cannot be removed.

*(b)* *C*-chart has been applied to sampling acceptance procedures based on number of defects per unit.

**18.** Answer any *two* of the following in brief : 3×2=6

*(a)* Explain what are chance causes and assignable causes of variation in the quality manufactured product.

*(b)* Define process control and product control.

*(c)* Define the terms specification limits and control limits.

**19.** Explain the construction of a control chart for fraction defective. Distinguish between defect and defective. 4+2=6

**20.** *(a)* Define acceptance sampling procedure and discuss its uses. 6

*Or*

*(b)* Describe double sampling plan and the general method of plotting OC curve of such a plan. 6

UNIT—6

**( Educational Statistics )**

**21.** Answer the following as directed : 1×2=2

*(a)* The underlying assumption in the construction of the T-scale is the normality of the trait being considered.

( Write True or False )

*(b)* IQ is regarded as an indication of an individual's ____ and ____ development.

( Fill in the blanks )

**22.** Answer any *two* of the following in brief : 3×2=6

*(a)* Explain the meaning of 'scaling' as used in the mental tests.

*(b)* Explain the importance of reliability and validity in test standardisation. What is their relationship to each other?

(c) Explain the important properties of parallel test.

23. What do you mean by Intelligence Quotient (IQ)? Describe the procedure and test for measuring IQ. 6

24. (a) Describe and compare the following methods of assessing the reliability of a test : 6

(i) Split-half technique

(ii) Rational equivalence

*Or*

(b) What is meant by reliability and validity of tests? Explain the use of parallel tests in psychological studies. 6

( 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 time series model $U_t = T_t S_t C_t R_t$ with components $T_t$, $S_t$, $C_t$ and $R_t$ is

*(i)* additive

*(ii)* multiplicative

*(iii)* mixed

*(iv)* None of the above

*(b)* The time series of bank clearings and bank deposits are influenced by the component

*(i)* secular trend

*(ii)* seasonal variation

*(iii)* cyclical variation

*(iv)* random movement

(c) Marshall-Edgeworth index number lies between

(i) Laspeyres' and Paasche's index number

(ii) Laspeyres' and Fisher's index number

(iii) Paasche's and Fisher's index number

(iv) None of the above

(d) Consumer price indices are useful for

(i) measuring the purchasing power of money

(ii) deflation of income

(iii) wage negotiation and wage contracts

(iv) All of the above

(e) If $D(p)$ and $S(p)$ are demand and supply curves of a commodity, $p$ is the price, then equilibrium price is given by

(i) $D(p) = S(p)$

(ii) $D'(p) = 0$

(iii) $S'(p) = 0$

(iv) either (ii) or (iii)

(f) If NRR is less than unity, then

(i) the population has a tendancy to increase

(ii) the population has a tendency to decline

(iii) the population has a tendency to remain more or less constant

(iv) None of the above

(g) Which of the following charts is used in quality control when quality characteristics of a product are not amenable to take measurement but can be identified by their absence or presence?

(i) $\overline{X}$-chart

(ii) $C$-chart

(iii) $R$-chart

(iv) None of the above

(h) National Advisory Board on Statistics (NABS) was established in

(i) 1982

(ii) 1951

(iii) 1949

(iv) 1950

2. *(a)* Define a time series. Mention its important components. Describe a method of fitting trend to a time series. 4+5=9

*Or*

*(b)* Why is the multiplicative model the most commonly used assumptions, as compared to additive model in time series analysis? Discuss the role of method of moving average in time series analysis. 4+5=9

3. *(a)* Develop Fisher's index and examine its merits and demerits. Why is the Fisher's index number said to be an ideal index number? Explain. 4+5=9

*Or*

*(b)* What do you understand by cost of living index number? Explain the role of index numbers in formulating government policies. 3+6=9

4. *(a)* State the law of demand and define price elasticity of demand. Discuss the type of data required for estimating elasticities of demand. 4+5=9

*Or*

*(b)* What is demand function? State the mathematical demand function. Discuss the difficulties in the empirical studies of demand analysis and methods of overcoming them. 2+3+4=9

**5.** *(a)* Define crude birth rate (CBR) and mention two of its merits and demerits. Discuss the importance of studying infant mortality rate (IMR) of a country. 5+4=9

*Or*

*(b)* Define a life table. Describe various components of a life table. How is the expectation of life at birth determined from a life table? 2+3+4=9

**6.** *(a)* What is meant by process control in industrial statistics? Explain how $\overline{X}$ and $R$ charts are drawn in practice. How would you interpret the points falling outside the control limits on these charts? 3+4+2=9

*Or*

*(b)* What is meant by statistical quality control? Distinguish between—

*(i)* process control and product control

(ii) control charts for variables and control charts for attributes
2+3½+3½=9

7. (a) Discuss about the functions of NSSO and CSS. 9

*Or*

(b) Write critical notes on industrial statistics and agricultural statistics in India. 9

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

(a) Uses of index number

(b) Sources of demographic data in India

(c) Specific death rates

(d) Utility function

(e) Three-sigma limits

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