Total number of printed pages–8

2022

STATISTICS

(Honours Elective)

Paper : STA–HE–5026

(Time Series Analysis)

Full Marks : 60

Time : Three hours

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

1. Answer **any seven** from the following questions as directed :   1×7=7

    (a) The general decline in sales of cotton clothes is attached to the component of the time series :

    (i)   Secular trend

    (ii)   Cyclical variation

    (iii) Seasonal variation

    (iv)   All of the above

    (Choose the correct option)

(b) Link relative method for measuring seasonal indices was expounded by .... (Fill in the blank)

(c) The conclusion drawn from time series analysis are not absolutely true. (State True **or** False)

(d) If the slope of trend line is positive it shows :

   (i) rising trend

   (ii) declining trend

   (iii) stagnation

   (iv) Any of the above
   (Choose the correct option)

(e) Indian population-explosion during Bangladesh War is attached to the component of the time series.

   (i) Secular trend

   (ii) Cyclical variation

   (iii) Random variation

   (iv) Both (ii) and (iii)
   (Choose the correct option)

(f) The term prosperity, recession, depression and recovery are in particular attached to .... (Fill in the blank)

(g) Most frequently used mathematical model of a time series is

   (i) additive model

   (ii) multiplicative model

   (iii) mixed model

   (iv) All of the above
   (Choose the correct option)

(h) Given the trend equation

   $\hat{Y} = 108 + 2 \cdot 88X$ with origin 1980 and yearly data given from 1980 to 1992, the monthly trend equation is
   .... *(Fill in the blank)*

(i) From the given five values 15, 24, 18, 33, 42 the three years moving averages are

   (i) 19, 22, 23

   (ii) 19, 25, 31

   (iii) 19, 30, 31

   (v) None of the above
   (Choose the correct option)

(j) Secular trend is indicative of long term variation towards :

   (i) increase only

   (ii) decrease only

(iii) either increase or decrease

(iv) All of the above

(Choose the correct option)

(k) Salient factors responsible for seasonal variation are :

(i) weather

(ii) social customs

(iii) festivals

(iv) floods

(Choose the correct option)

(l) "If the trend line is concave downwards, the value of the moving average will always be too high; if the trend line is concave upward the value of the moving average will always be too low."

(State *True* **or** *False*)

2. Answer **any four** questions from the following :

2×4=8

(a) What are the main problems in the analysis of time series ?

(b) Give the merits and demerits of the simple average method.

(c) Explain graphical method of determining trend.

(d) Define time series with *two* examples.

(e) Write a note on mixed models.

(f) What do you mean by deseasonalisation of data in time series ?

(g) Write a short note on Gompertz curve with its relevance in time series analysis.

(h) Which component of time series is mainly applicable in the following example ?

    (i) Values of exports from India

    (ii) Increase in a hill station population during summer vacations

    (iii) A continuously increasing demand for synthetic fibre

    (iv) Price of gold over a long time

3. Answer *any three* of the following questions :   5×3=15

(a) Explain the additive and multiplicative model in time series stating clearly the assumptions and discuss their relative merits.

(b) Describe the procedure of computing seasonal indices by ratio to trend method. Also mention its merits and demerits.

(c) Explain cyclical variation of a time series. How can you isolate cyclical variation by residual method ?

(d) How can the ratio to moving average method be applied for computing the seasonal indices ?

(e) Explain semi average method of determining trend. Also discuss its merits and demerits.

(f) Show that the 4 years centered moving average is equivalent to a 5 years weighted moving average with weights $\frac{1}{5}(1, 2, 2, 2, 1)$ respectively.

(g) How can you convert annual trend equation to
  (i) half yearly trend equation,
  (ii) monthly trend equation ?

(h) (i) Explain merits and demerits of Link relative method.   3

   (ii) How can a best model for a time series be selected ?   2

4. Answer **any three** from the following questions : 10×3=30

(a) Discuss the moving average method for determining the trend. What are the advantages and disadvantages of the moving average method ? 5+5=10

(b) What do you understand by seasonal variation ? Explain with examples. Describe the method of link relatives for finding seasonal indices. 2+8=10

(c) Explain how would you fit second degree trend equation $a + bx + cx^2$? State how the shape of second degree curve depends on the value of b and c. Also discuss the merits and demerits of trend fitting by the principle of least square. 3+3+4=10

(d) Discuss briefly irregular variation in the context of time series. How do you estimate the variance of the random component of a time series ? 5+5=10

(e) What is exponential smoothing ? How does the method of exponential smoothing help in business forecasting ? 4+6=10

(f) (i) Discuss briefly the importance of time series analysis. 6

(ii) How to decide the length of the period of moving average ? 4

(g) Explain the procedure for fitting a logistic curve to a time series. What are the main properties of this curve ?

6+4=10

(h) (i) What factors are generally responsible for the occurrence of cycles ? 5

(ii) What are the essential requirements for proper analysis of a time series ? 5

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