[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 8788 **C** **Roll No.....**

Unique Paper Code : 237302

Name of the Paper : STHT-303 : Applied Statistics-II

Name of the Course : B.Sc. (Hons.) Statistics, Part II

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all.
3. Q. No. 7 is compulsory and the remaining **five** questions are to be attempted from the Sections A and B, selecting at least **two** from each section.

SECTION A

1. (a) Describe the different components of a time series. Give suitable examples for each.

   (b) Enumerate the various properties of the curve

$$U_t = \frac{k}{1+e^{a+bt}} \quad ; \; b < 0$$

   Trace the curve and describe its different phases with respect to a time series data of production. (5,8)

2. (a) Name the characteristic movement of time series with which you will mainly associate –

   (i) an increase in employment for sales during the summer months,

(ii) a fire in a factory that delays the factory's production for 2 weeks,

(iii) a continually increasing demand for smaller automobiles,

(iv) a fall in death rate due to scientific advancement, and

(v) an era of prosperity,

(vi) issue of library books during examinations.

Give reasons for your answers.

(b) It is desired to determine a trend curve in a time series by a moving average method covering a consecutive set of nine points which would accurately represent the series if it consists of a cubic polynomial in time variable. Obtain the formula

$$[9, 3] = \frac{1}{231}[-21, 14, 39, 54, 59, 54, 39, 14, -21].$$

Further, show that the formula is, in fact, good enough, for a quadratic polynomial. (6,7)

3. (a) Describe the method of 'Ratio-to-moving averages' for measuring the seasonal variations, stating clearly the assumptions made.

(b) Describe a method for estimating the variance of the random component in a time series, stating clearly the assumptions under which it is applicable. (6, 7)

SECTION B

4. (a) What do you understand by the term Statistical Quality Control ? Distinguish between 'process' and 'product' control.

(b) Discuss the natural tolerance limits and specification limits. What do you understand by Process Capability Ratio ? Construct modified control limits for the $\overline{X}$ chart. (5,8)

5. (a) If p_n is the probability of mean of a random sample of size n to exceed UCL and the r^{th} sample is the first to exceed UCL, then show that $E(r) = \frac{1}{p_n}$.

(b) Explain the role of the c-chart in statistical quality control. Besides its use in manufacturing, in what other fields has c-chart technique been usefully employed ? How are the control limits for c-chart obtained ? Justify the distribution used by you for the derivation of the above control limits. (5,8)

6. (a) Define the terms :

(i) Acceptance Quality Level

(ii) Lot Tolerance Proportion Defectives

(iii) Producer's process average

(iv) Producer's risk

(v) Consumer's risk

(b) Explain the two approaches to find sample number and acceptable number of defectives in a single sampling plan for attributes. (7,6)

SECTION C

7. (a) Write a short note on NSSO, highlighting its main functions and major publications.

(b) (i) Distinguish between de facto and de jure basis of population enumeration. In which year did India switch from de facto basis to de jure ?

(ii) Name the authorities engaged in collection and publication of price statistics on national level, in India.

(iii) Which agencies are responsible for the collection and publication of statistics on Trade in India ? Name the two groups into which Trade Statistics is classified. (4,6)