

**PAPER NO-13: APPLIED STATISTICS-II**

1. Time Series and its Analysis
  - 1.1 Introduction
    - 1.1.1 Components of Time-Series
    - 1.1.2 Aims and objectives of analyzing time series
    - 1.1.3 Models in time series
  - 1.2 Measurement of Trend
    - 1.2.1 Free hand curve Method
    - 1.2.2 Method of Semi-Averages
    - 1.2.3 Curve fitting by the principle of least squares, growth curves and their properties, Fitting of growth curves
    - 1.2.4 Method of Moving Averages
  - 1.3 Measurement of Seasonal Variation
    - 1.3.1 Method of Simple Averages
    - 1.3.2 Ratio-to- Trend Method
    - 1.3.3 Ratio-to-Moving Average Method
    - 1.3.4 Link Relative Method
    - 1.3.5 De-seasonalisation of data
  - 1.4 Measurement of Random Component
    - 1.4.1 Variate Difference Method
2. Statistical Quality Control
  - 2.1 Definition of quality
    - 2.1.1 Dimensions of quality
    - 2.1.2 Historical perspective of quality control and improvements starting from World War II
    - 2.1.3 Quality system and standards
    - 2.1.4 Seven tools of SPC
    - 2.1.5 Chance and Assignable Causes of quality variation.
  - 2.2 Process Control
    - 2.2.1 Construction and Statistical basis of  $3\text{-}\sigma$  Control charts
    - 2.2.2 Rational Sub-grouping
    - 2.2.3 Analysis of patterns on control chart
    - 2.2.4 Control charts for variables
    - 2.2.5 Estimation of process capability
    - 2.2.6 Control Charts for attributes
    - 2.2.7 Comparison between control charts for variables and control charts for attributes
  - 2.3 Acceptance sampling plan
    - 2.3.1 Terminology of sampling inspection plan
    - 2.3.2 Single sampling plan - Derivation of OC, ASN, ATI, AOQ functions
    - 2.3.3 Determination of n and c using the approaches
3. Psychological and Educational Statistics
  - 3.1 Introduction
    - 3.1.1 Scaling individual test items in terms of difficulty
  - 3.2 Scaling Scores on a Test Scores
    - 3.2.1 Standard Scores
    - 3.2.2 Normalized Scores
    - 3.2.3 T-Scores
    - 3.2.4 Percentile Scores (Excluding the stanine scale)
  - 3.3 Scaling Judgments

- 3.3.1 Scaling ratings in terms of Normal curve
- 3.3.2 Scaling ranks in terms of the Normal curve
- 3.4 Reliability of Test Scores
  - 3.4.1 Methods of determining reliability
  - 3.4.2 Effect upon reliability of lengthening or repeating a test
- 3.5 Validity of Test Scores
  - 3.5.1 Validity and length of a test
  - 3.5.2 Relation of Validity to Reliability
  - 3.5.3 Different types of validity

## WEEK-WISE DETAILS

### Week 1-3: Time Series and its analysis

- Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1967): *Applied General Statistics*, 2<sup>nd</sup> Edition, Prentice Hall. pp. 240- 253, 261-319, 320-339,

### Week 4-5: Time Series and its analysis (continued)

- Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1967): *Applied General Statistics*, 2<sup>nd</sup> Edition, Prentice Hall. pp. 320-339
- Mukhopadhyay P. (1999): *Applied Statistics*, Books and Allied (P) Ltd. pp 363-364

### Week 6-8: Statistical Quality Control

- Montgomery, D. C. (2009): *Introduction to Statistical Quality Control*, 6<sup>th</sup> Edition, Wiley India Pvt. Ltd. pp. 4-7, 12, 23-24, 180-181, 195-197, 227-230, 233-235, 237-238, 243-245, 246-247 (till 6.19), 251-254, 288-292, 300-304, 308-310, 314 (last Para)-315, 326-327, 632-635, 637-640 (till 2nd para), 643-646

### Week 8-10: Statistical Quality Control (continued)

- Gun, A. M., Gupta, M. K. and Dasgupta, B (2008): *Fundamentals of Statistics, Vol. II*, 9<sup>th</sup> Edition, World Press. pp. 505-507
- Gupta, S. C. and Kapoor, V. K. (2007): *Fundamentals of Applied Statistics*, 4<sup>th</sup> Edition, Sultan Chand and Sons. pp. 1.8-1.10
- Montgomery, D. C. (2008): *Introduction to Statistical Quality Control*, 4<sup>th</sup> Edition, Wiley India Pvt. Ltd, pp. 170-172

### Week 11-12: Psychological and Educational Statistics

- Garrett, E and Woodworth, R.S. (1981): *Statistics in physiology and education*, 10<sup>th</sup> Reprint, Vakils, Feffer and Simons Ltd. Henry. pp 309-311, 311-323, 327-332, 354, 356-358, 360, 337-343
- Gun, A. M., Gupta, M. K. and Dasgupta, B. (2008): *Fundamentals of Statistics, Vol. II*, 9<sup>th</sup> Edition, World Press. pp. 350-351

## Practical/ Lab work

### LIST OF PRACTICALS

1. Fitting and plotting of modified exponential curve by method of three selected points
2. Fitting and plotting of Gompertz curve by method of partial sums
3. Fitting and plotting of logistic curve by method of three selected points
4. Fitting of trend by Moving Average Method (for n even and n odd)
5. Measurement of Seasonal indices Ratio-to-Trend method
6. Measurement of Seasonal indices Ratio-to-Moving Average method

7. Measurement of seasonal indices Link Relative method
8. Calculation of variance of random component by variate difference method
9. Construction of  $\bar{X}$ -bar and R chart (without trial control limits)
10. Construction of  $\bar{X}$ -bar and s chart (without trial control limits)
11. Construction of p-chart (fixed sample size)
12. Construction of c- chart
13. Single sampling inspection plan—OC, ASN, ATI, AOQ, AOQL curves
14. Scaling of scores