STOE-201 (Open Elective) Run by Department of Statistics
Quantitative Techniques (2nd Semester)

<div align="right">
Maximum Marks-80
Internal Assessment Marks—20
Time:-03 Hours
Credit: 03
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Paper Code: STOE- 201
Paper: Quantitative Techniques (Open Elective Paper)
Course Outcomes:
CO1: Acquired knowledge to apply Statistical tools for the solution of business/ economic problems.
CO2: Acquired knowledge to calculate Index Numbers.
CO3: Be familiar with the sources of vital statistics data and how birth date, mortality rate and reproduction rate are calculated and interpreted.
CO4: To understand how the forecasting can be used in economic analysis.
CO5: To understand how to make a process stable in industries and other areas.

Section –I
Classification of Data, variable and measurement scales. Presentation of Data. Measures of Central Tendancy and Dispersion, Skewness and Kurtosis. Measures of Association of Attributes. Correlation and Regression. Principle of Least Squares , Multiple and Partial correlation. Fitting of Polynomial and Exponential Curves.

Section –II
Random variables. Probability mass function, Probability density function and Commulative distribution function. Expectation and its properties. Moments, moment generating function and probability generating function. Discrete Probability distributions: Bernolli, Bionomial, Poisson, Negative Binomial, Geometric and Uniform. Continuous Probability distributions: Normal, Exponential, Log Normal and Uniform, Fitting of Bionomial, Poisson and normal distribution.

Section –III

Index numbers: Types, uses and their construction. Cost of living index numbers. Test of adequacy of Index numbers.
Time Series: Components and Models of time series. Measurements of trend and seasonal indices, Forcasting and Estimation.

Section –IV

Statistical Quality Control. Purposes and construction of control charts for variables and attributes using 3 sigma limits and 6 sigma limits. Single and double Sampling Inspection plans. Natural tolerance limit and modified control limits.
Vital statistics: Methods of obtaining Demographic data, Measurement of Mortality and Fertility. Complete Life and Abridged Life Tables.

Books Recommended

1. Goon, A.M., Gupta, M.K. and Dasgupta, B.   :   Outline of Statistics Volume-I & II
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.   :   Fundamental of Statistics Volume-I &II
3. Rohtagi, V. K. and Md. Ehsanes Saleh, A. K.   :   An Introduction to Probability and Statistics
4. Mood, A.M., Graybill, F.A. and Boes, D.C.   :   An Introduction to Theory of Statistics
5. Croxton, F.E. and Cowden, D.J.   :   Applied General Statistics

6. Kendall S.M. and Stuart A. : The Advanced Theory of Statistics

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C & D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.

STOE- 202 (Open Elective) Run by Department of Statistics
Sampling and Estimation Techniques (2nd Semester)

Maximum Marks-80
Internal Assessment Marks—20
Time:-03 Hours
Credit: 03

Paper Code: STOE- 202
Paper: Sampling Techniques
Course Outcomes:
CO1: Ability to understand techniques for conducting Sample Surveys.
CO2: Achieved knowledge to study population parameters using sampling techniques.
CO3: Ability to understand existing estimators.
CO4: Achieved knowledge to understand techniques for Sampling Designs.

Section –I
Population, sample, sampling distribution, standard error. Testing of Hypotheses: Simple and composite hypotheses, Null and alternative hypotheses, two types of errors, critical region and level of significance, one tailed test, two tailed test, Test of significance (Single and two samples problems) for normally distributed data. Goodness of fit test.

Section –II
Sample versus Complete Enumeration. Designing of Sample Surveys, Sources of Errors in Sample Surveys, Types of Non-Response Errors.
Probability and Non-probability Sampling: Simple Random Sampling with and without replacement for the estimation of Mean and Total, Determination of Sample Sizes of specified precision.

Section –III
Stratified Sampling: Proportional and Optimum Allocation, Estimation of gain due to stratification, Construction of strata, Determination of number of strata. Systematic, Cluster and Probability Proportional to Size Sampling. Comparison of stratified sampling with simple random sampling.

Section –IV
Analysis of Variance: one- way, two -way (with one and multiple but equal number of observations per cell). Completely Randomized Designs, Randomized Block Designs and Latin Square Designs.
Factorial Experiments: Definition, Estimation of factor's effect, Analysis of the factorial experiments, Confounding: complete and partial confounding.

Books Recommended

1. Mood A.M., Graybill, F.A. & Boes, D.C.   :   Introduction to the Theory of Statistics
2. Goon, A.M., Gupta, M.K. and Dasgupta, B.   :   Fundamental of Statistics, Vol-II
3. Singh D. & Chaudhary F.S.   :   Theory & Analysis of Sample
                                                   Survey Designs Theory and Methods
4. Mukhopadhyay, Primal   :   of Survey
                                                   Sampling Design and Analysis
5. Dass, M.N. and Giri, N.C   :   of Experiments

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C & D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.

STOE-301 (Open Elective) Run by Department of Statistics
Optimization Techniques (3rd Semester)

Maximum Marks: 80
Internal Assessment Marks: 20
Time: 3 Hours
Credit: 03

Paper Code: STOE- 301
Paper: Optimization Techniques- I
Course Outcomes:
CO1: Acquainted with the formulation of the real life problems as Linear Programming Problems (LPP).
CO2: Able to apply techniques for achieving optimal solution of the problems.
CO3: Acquired knowledge for optimal solutions of the Transportation and Assignment Problems.
CO4: Enhanced computing power for obtaining alternate solutions of the LPP.
CO5: Able to understand the importance of extreme points in obtaining the optimal solution of LPPs.

Section –I
Linear Programming Problems: Formulation and their Solution by Simplex and Artificial Variable Techniques. Resolution of Degeneracy in LPP. Duality in LPP: Solution of Primal-Dual Problems by Dual Simplex Method and Economic Interpretation of Duality. Solutions of Integer Programming Problems (IPP).

Section –II
Transportation Problems: Mathematical Formulation and their Optimal Solution. Assignment Problems: Mathematical Formulation and their Solution by Hungarian Assignment Method.
Theory of Games: Characteristic of Games, Minimax (Maximin) Criterion and Optimal Strategy. Solution of Games with (or without) Saddle Point. Solution of mxn Games by Linear Programming Method. Principle of Dominance.

Section-III
Markov Chains: Classification of States and Chains. Higher Transition Probabilities. Elementary Idea of Birth and Death Processes. Queuing Theory: Description of Queuing Problems, Notations, Measures of Effectiveness and Characteristics. Queuing Systems: M/M/1, M/M/C, M/M/1/R, M/G/1 and G/M/1 Models with Waiting Time Distribution and their Steady State Solutions.

Section –IV

Inventory Problems**:** Classification and Cost involved in Inventory Problems. Solution of Deterministic and Probabilistic Inventory Models. Job Sequencing Problems: Processing of N Jobs through Two, Three and M Machines. PERT and CPM Techniques. Labeling Time Estimate and Determination of Critical Path on Network Analysis.

Books Suggested:

1.   Gass, S.I.   : Linear Programming (Methods and Applications)
2.   Kambo, N.S   : Mathematical Programming Techniques
3.   Hadely,G.   : Linear Programming
4   Medhi, J.   : Stochastic Processes (New Age International)
5.   Donal, Gross & Carl, M. Hariss   : Fundamentals of Queuing Theory (Wiley)
6.   Kashyap, B.R.K &   : An Introduction to Queuing Theory
        Chaudhary, M.L.   (A.A.Publications)
7.   Churchman   : Introduction to Operations Research (J. Wiley)
8.   Sharma, S.D.   : Operation Research (Kedar Nath Ram Nath, India)

Note: The examiner is to set the question paper into five units- A, B, C, D & E. In each unit A, B, C& D, he/she has to set two questions of 16 marks each from section I, II, III, & IV respectively and the candidate will attempt one question from each unit. In unit E, there will be 8 short answered questions of 2 marks each, covering the whole syllabus and the candidate has to attempt all the questions.