5th SEMESTER (HONOURS)

STEH – 51 (TH)

Mathematical Methods and Distribution Theory (Theory)

Marks : 75
Lectures : 75

Unit-I: Numerical differentiation based on Newtons forward and backward interpolation formulae. Numerical integration – Weddles Rule and Euler's formula for summation and integration. Solution of algebraic and transcendental equation by Bisection, False position, iteration method, Newton Raphson and their convergence (polynomials upto degree 4).

Function of several variables, partial derivatives, maxima and minima, constrained maxima and minima, applications of Lagrangian multipliers. Multiple integrals of Jacobian of transformation, Beta and Gamma integrals.

Lectures : 15

Unit-II: Linear Algebra: Linear System of equations. Row Echelon Form (REF) and Reduced REF. Gaussion elimination and Gauss Jordan Reduction Method. Inverse of a matrix. Vectors Spaces and Subspaces, Linear dependence and independence, Homogeneous and non Homogeneous systems, Rank of a matrix and applications. Eigen values and Eigen Vectors, Caley Hamilton Theorem, Quadratic forms and its different types. **Lectures : 15**

Unit-III: Random Variables and expectations: Joint, marginal and conditional Distribution Functions and their properties. Properties of expectation of sums of Random Variables (R.V.s). Covariance and Variance of sums. Conditional expectation, computing expectations, variance and Probability by conditioning. Conditional variance. Generating Functions- Joint MGF, CGF and PGF of R.V.s , their properties and applications, characteristic function. Computing MGF by conditioning. **Lectures : 15**

Unit IV: Statement, properties and applications of negative binomial, hypergeometric, Multinomial, Beta, Gamma, Cauchy, Weibull, Log-normal distributions- their properties and applications. **Lectures : 15**

Unit-V: Derivation and independence of Sampling distributions of sample mean and variance in random sampling from normal population, sampling distribution of sample total for negative binomial, normal and gamma distributions, Chi-square, t, and F distributions-properties and their derivation. **Lectures : 15**

Text Books :

Saxena, H.C. (1998) : Calculus of Finite Difference, S. Chand & Co.

Kolman, B. and Hill, D. R. (2007) : Introductory Linear algebra with applications, 7th Edn., Pearson and Education, New Delhi.

Scarborough, J. B,(1955) : Numerical Mathematical Analysis Oxford and IBH Publishing

Vasishtha, A. R. and, Vasishtha, A. K. : Matrices, KRISHNA SERIES

Biswas, S : Textbook of Matrix Algebra, 4th edn.

Ross, S. M (2003) : A first Course in Probability, 6th Edn. Pearson and Education, New Delhi

Hogg R.V. and Tanis, E.A (2003) : Probability and Statistical Inference, Pearson Education, New Delhi

Hogg, R. V., Craig, A. T. (2002) : Introduction to Mathematical Statistics, 5th Edn. Pearson Education, New Delhi

References :

Hadley, G. (2002) : Linear Algebra, Narosa Publishing House, New Delhi

Mood, A.M. Graybill, F.A. and Boes, D.C. (1974) : Introduction to the Theory of Statistics Tata-Mc-Graw Hill.

Rohagi, V. K , and Saleh, A. K M. (2001) : An Introduction to Probability and Statistics, 2nd edn., John Wiley

Goon A.M., Gupta, M.K. and Dasgupta, B(1999) : Fundamental of Statistics, Vol-I, World Press Kolkata.

Sastry, S.S. (1999) : Introductory Methods of Numerical Analysis, Prentice Hall, India.

Saxena, H.C. (1998 : Calculus of Finite Difference, S.Chand & Co.

S.C Gupta, and Kapoor, V.K. (2000) : Fundamentals of Mathematical Statistics, S. Chand and Co

Ross, S. M (2007) : Introduction to Probability Models, Elsevier, 9th Edn.

Sastry, S.S. (1999) : Introductory Methods of Numerical Analysis, Prentice Hall, India.

5th SEMESTER (HONOURS)

STH – 51 (PR)

Mathematical Methods and Distribution Theory (Practical)

Unit-I:
1. 1st and 2nd derivatives based on Newton's Forward and Backward interpolation formulae.
2. Numerical integration using Weddles Rule and Euler's formulae
3. Solution of equations by Bisection, False position, iteration method, Newton Raphson (polynomials upto degree 4)

Unit-II
4. Solution of equations by Gaussion elimination and Gauss Jordan Reduction Method.
6. Inverse of a matrix (by adjoint and by Gauss Jordan Reduction Method)
7. Eigen values and Eigen Vectors
8. Finding power of a Matrix using Caley Hamilton Theorem

Unit-III
9. Fitting of negative binomial, hypergeometric, Multinomial
10. Fitting of Beta, Gamma, Log-normal distributions.

Reference :

Scarborough, J. B,(1955)	:	Numerical Mathematical Analysis Oxford and IBH Publishing
Kolman, B. and Hill, D. R. (2007):		Introductory Linear algebra with applications, 7th Edn., Pearson and Education, New Delhi.
Saxena, H.C. (1998)	:	Calculus of Finite Difference, S. Chand & Co.
Sastry, S.S. (1999)	:	Introductory Methods of Numerical Analysis, Prentice Hall, India.
S.C Gupta and Kapoor, V.K. (2000)	:	Fundamentals of Mathematical Statistics, S. Chand and Co.
Snedecor, G. W. and Cochran, W.G. (1968)	:	Statistical Methods. Sixth Edition
Bhattacharyya, G. K. and Johnson, R. A. (1977)	:	Statistical Concepts and Methods, Wiley Series, New York

5th SEMESTER (HONOURS)

STEH – 52 (TH)
Linear Models, Regression, Design of Experiments and Operations Research. (Theory)

Marks : 75
Lectures : 75

Unit-I: Linear Models: theory of linear estimation, estimability of linear parametric function and BLUE, method of least squares, Gauss-Markov theorem, Gauss – Markov linear model.
Lectures : 15

Unit-II: Regression analysis : estimation and tests of regression parameters in simple and multiple linear regression under usual assumptions, related interval estimation. Violation of usual assumptions concerning normality, homoscedasticity and collinearity. Diagnostics using probability plots. Co relation ratio and co relation index.
Lectures : 15

Unit-III: Two way classifications with m observations per cell under fixed, random and mixed effects models. 3^2 factorial experiments. Complete and partial confounding under 2^3 factorial experiment. Analysis of covariance (one way and two way)
Lectures : 15

Unit-IV: Linear programming: introduction, definition of general linear programming problems, formulation and examples of LPP, problems occurring in various fields, graphical method of solving an LPP, slack & surplus variables.
Lectures : 15

Unit-V: Representation of transportation and assignment problem as LPP, solution of transportation problems using initial basic feasible solution by North-West corner rule, Matrix minima and Vogel's methods, assignment problem using Hungarian method.
Lectures : 15

Text Books :

Joshi, D. D. (2003) : Linear Estimation and Design of Experiments, New Age International Publishers, New Delhi

Biswas, S.(1998) : A Linear Models Approach to Regressiion Analysis and its Applications

Montgomery, D. C., Peak,E. A.: and Vining G.G.(2010) : Introduction to Linear Regression Analysis, 3rd Edn, Wiley

Gass, S. I (2003) : Linear Programming: Methods and Applications

Hadley, G. (1962) : Linear Programming, Addison-Wesley Pub

Das, M. N. and Giri, N. C. (2006) : Design and Analysis of Experiments, New age international Publishers, New Delhi.

Reference:

Searle, S. R. (1997) : Linear Models, John Wiley

Draper, N.R. and Smith, H. (1981) : Applied Regression Analysis, John Wiley.

Kanti Sarup, Gupta, P. K. and Monmohan (1998) : Operations Research.

Goel, B. S. and Mittal S. K. (1974) : Operations Research Pragati Prakashan Meerut. U.P.

Chatterjee, S. and Price, P. (1991) : Regression Analysis by example, Second Edition, John Wiley & Sons.

Cochran, W.G and Cox, G.M (1992) : Experimental Designs, 2nd Edition

Federer , W. T. (1955) : Experimental design: theory and application

5th SEMESTER (HONOURS)

STEH – 52(PR)

Regression, Design of Experiments and Operations Research (Practical).

Unit-I:

1. Estimation of regression coefficients by least square method.
2. Testing of hypothesis concerning regression coeffients, correlation coefficients for simple and multiple regressions
3. Confidence intervals.
4. Problems based on residual analysis.

Unit II:

5. ANOVA for two way classified data with m observations per cell.
6. Factorial Experiments: 2^3 & 3^2

7. Complete and partial confounding for 2^3.
8. Covariance analysis.

Unit-III: 9. Solving LPPs by graphical method.

10. Problem based on Transportation problem: (a) Vogel Method and (b) North West corner rule
11. Solution of assignment problem by Hungarian Method

Reference :

Montgomery, D. C., Peak E. A. and Vining G.G. (2010)	:	Introduction to Linear Regression Analysis, 3rd Edn, Wiley
Gass, S. I (2003)	:	Linear Programming: Methods and Applications
Hadley, G. (1962)	:	Linear Programming, Addison-Wesley Pub
Das, M. N. and Giri, N. C. (2006)	:	Design and Analysis of Experiments, New age international Publishers, New Delhi.
Federer , W. T. (1955)	:	Experimental design: theory and application
Draper, N.R. and Smith, H. (1981)	:	Applied Regression Analysis, John Wiley.
Kanti Sarup, Gupta, P. K. and Monmohan (1998)	:	Operations Research.
Chatterjee, S. and Price, P. (1991)	:	Regression Analysis by example, Second Edition, John Wiley & Sons.
Cochran, W. G. and Cox, G. M. (1992)	:	Experimental Designs, 2nd Edition
Snedecor, G. W. and Cochran, W.G. (1968)	:	Statistical Methods. Sixth Edition