UNIFIED SYLLABUS OF STATISTICS
B.A. & B.Sc. Part- III

Paper 1 : Non-parametric Methods and Numerical Analysis

UNIT – I

Non-parametric tests – tests for randomness and test for goodness of fit. One sample tests : sign test, Wilcoxon signed rank test. Two sample tests : run test, Kolmogorov Smirnov's test. Median test and Mann – Whitney U test, Spearman's rank correlation test

UNIT – II

Calculus of finite differences, operators, separation of symbols, examples and problems. Interpolation formulae with remainder term. Newton's forward and backword formulae for equal intervals.

UNIT – III

Central difference formulae, Newton's divided difference formula for interpolation, Lagrange's interpolation formula.

UNIT – IV

Numerical integration : Derivation of general quadrature formula for equidistant ordinates. derivation of Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Weddle's rule. Numerical differentiation using Newton's forward and backward formulae.

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Paper II : Applied Statistics

UNIT – I

Time series – its different components, illustrations, additive and multiplicative models, determination of trend-graphic, semi-average, least square and moving average methods, measures of seasonal variation-simple average, ratio to moving average, ration to trend, link related method.

UNIT – II

Index number – its definition, application of index number, price relative and quantity or volume relatives, link and chain relative, problem involved in computation of index number, use of averages, simple aggregative and weighted average method. Laspeyre's, Paashe's and Fisher's index number, time and factor reversal tests of index numbers, consumer price index

UNIT – III

Demographic methods : Sources of demographic data – census, register, ad-hoc survey, hospital records, demographic profiles of Indian Censuses. Measurement of mortality, crude death rates, age specific death rates, infant mortality rates. Measurement of fertility – crude birth rate, general fertility rate, age-specific birth rate, total fertility rate, gross and net reproduction rate. Standardized death rates. Complete life table, its main features and construction (Abridged life table).

UNIT – IV

Control charts for variables and attributes. Sampling inspection by attributes – single and double sampling plans. Producer's and consumer's risk, OC, ASN, ATI functions AOQL and LTPD of sampling plans. Sampling inspection by variables – simple cases.

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Paper III : Linear Programming & Computational Techniques

UNIT – I

General linear programming problems and their formulations. Method for solving LPP : Graphical Method, Simplex method. Duality in LPP.

UNIT – II

Transportation problem: North-west corner rule, Least cost method, Vogel's approximation method. Optimum solution by MODI method. Assignment Problem : Hungarian Algorithm.

UNIT – III

Introduction to computer : What is computer, characteristics, limitations and applications of computer, fundamentals of hardware, software and their types, number system (Binary, octal, decimal, hexadecimal), operating systems and its types.

Computer language and communication : communication, its components and modes, MODEM, digital and Analog signals, introduction to networking, various topologies of network, LAN, WAN, working knowledge of internet, low level language, high level language, 4GL.

UNIT – IV

C Programming : Design of Algorithms and flow charts, character set, constants, variables and data types, declaration of variables, operators and expressions.

Input and output operation, decision making with IF, IF-ELSE, nesting IF, ELSE IF ladder, switch structure, goto structure, loops – FOR, WHILE, DO-WHILE, BREAK, CONTINUE.

Array declaration, initialization, of one dimensional and two dimensional.

B.A. / B.Sc. Part III

PRACTICALS

The practical examination will be based on papers Paper I, Paper II and Paper III and will cover the following experiments:

List of Practical experiments:

1. Non-parametric test – Run test and Test for randomness.
2. Construction of forward difference tables and divided difference tables.
3. Interpolation by Newton's forward difference formula for equal intervals and calculation of error.
4. Interpolation by Newton's divided difference formula for unequal intervals.
5. Interpolation by Lagrange's formula.
6. Approximate Integration (Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules), Weddle's rule.
7. Time Series : Trend by moving average method & Method of least squares. Seasonal indices.
8. Index number : Construction of various index numbers and application of mathematical tests.
9. Vital statistics : Various birth & death rates. Life table.
10. Control charts : $\bar{x}$, R, p and c-charts.
11. Computer applications : Problems involving sequential, decision making and looping structure. Arrays applications – searching, sorting, largest & smallest element of array, addition, multiplication of 2 arrays. Statistical problems – mean, variance, moments, correlations & regression.

REFERENCES :–

1. Mood, A.M., Graybill F and Boes D.C. : Introduction to the theory of Statistics.
2. Gibbons, J.D. : Non-parametric statistical inference
3. Conover, W.J. : Practical Non-parametric Statistics
4. Freeman : Finite Differences.
5. Scarborough : Numerical Analysis.
6. S.S. Sastry : Introductory Methods of Numerical Analysis.
7. Saxena, H.C. : Calculus of Finite differences.
8. Croxton F.E. and Cowden D.J. : Applied General Statistics
9. Goon, Gupta and Dasgupta : Fundamentals of Statistics, Vol. I & II
10. Gupta, S.C. and Kapoor, V.K. : Applied Statistics.
11. Swarup Kanti, Gupta P.K. and Man Mohan : Operations Research.
12. Taha, H.A. : Operations Research.
13. Sinha, P.K. : Fundamentals of computer.
14. Yashwank Kanitkar : Let us C.
15. Balaguru Swamy : Ansi C.

5.   Study of RC and TC coupled amplifiers

6.   Study of AF and RF oscillators

Nuclear Physics

1. Study of absorption of alpha and beta rays.

2. Study of statistics in radioactive measurement.

Text and Reference Books

B.G. Strechman, "Solid State Electronic Devices". II Edition (Prentice-Hall of India, New Delhi, 1986).

W.D. Stanley, "Electronic Devices, Circuits and Applications" (Prentice-Hall, New Jersey, USA, 1988).

D.P. Khandelwal, "A Laboratory Manual for Undergraduate Classes (Vani Publishiing House, New Delhi). S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).

Instructions for Paper Setting

All questions carry equal marks.

Section A: One compulsory question with four parts. One part (numerical or short answer type) from each unit.

Section B: Two questions (long answer or numerical type) from each unit but only one question from each unit is to be attempted.