B.Sc. /B.A. Part – III Examination 2024
Statistics

Teaching and Examination Scheme

Subject/Paper	Period/Week		Exam. Hours	Max Marks	Min.Pass Marks
Statistics	L	P			
Paper I	2	-	3	50	54
Paper II	2	-	3	50	
Paper III	2	-	3	50	
PRACTICALS	-	6	4	75	27

B.Sc/B.A. Part III Examination 2024
Statistics
    Paper   I : Sampling Distribution, Estimation and Testing of Hypothesis
    Paper   II : Statistical Quality Control & Operation Research
    Paper   III: Designs of Experiments and Non-Parametric Tests
    Practical

Total Marks: 50   **Time: 03:00 Hrs.**

Paper I
Sampling Distribution, Estimation and Testing of Hypothesis

Note: Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C.
Section A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 1 mark.

Section B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 3.5 marks.

Section – C: Will consist of total 05 questions one from each unit. The paper setter will set one question from each Unit and Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 7.5 marks.

Unit 1: Concepts of sampling distribution and standard error, derivation of X^2 (chi-square), t and F distribution, their simple properties.

Unit 2: Concepts of point estimation, properties of point estimators such as consistency, unbiasedness, minimum variance. Unbiased estimators, efficiency and simple notion of sufficiency, factorization theorem (without proof).

Unit 3: Different methods of finding estimators such as method of moments, method of minimum variance, method of least square and maximum likelihood (without detailed discussion of their properties).

Unit 4 : Testing of hypothesis, siple and composite hypotheses, two types of errors, idea of best critical region, power of a test, power curves in simple cases. Nayman- Pearson lemma.

Unit 5 : General theory of test of significance, Large sample tests for mean and proportions. Applications of X^2 (chi-square) t and F in testing of hypotheses. The interval estimation of Normal population mean, variance, difference of means, ratio of variances.

SUGGESTED BOOKS
Gupta, S.C. and Kapoor, V.K.: Fundamental of Mathematical Statistics, Sultan Chand and Sons, Delhi.
Surendran, P.U. and Saxena, H.C.: Statistical Inference, S.Chand & Co., Delhi.

Statistics

Total Marks: 50 **Time: 03:00 Hrs.**

Paper II
Statistical Quality Control & Operation Research

Note: Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C.

Section A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 1 mark.

Section B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 3.5 marks.

Section – C: Will consist of total 05 questions one from each unit. The paper setter will set one question from each Unit and Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 7.5 marks.

Unit 1: Concept of Statistical quality control, Control charts: $(\bar{x}, R), (\bar{x}, \sigma), p, np$, c-charts, their constructions and uses.

Unit 2: Sequential Analysis: Sequential probability ratio test, O.C. and A.S.N. functions and their applications.

Unit 3: Sampling Inspection by attributes: Producer's risk, consumer's risk, AOQL, ASN, OC, Single, Double and Sequential Sampling plans and their comparison.

Unit 4: Introduction to operation Research, Queuing theory (I): Queuing systems, characteristics of queuing system, Poisson process, exponential distributions of number of arrivals, inter arrival time, service time.

Unit 5: Queuing Theory (II): Classification of queues, model I: Model $(M/M/I) : (\infty / FIFO)$ and its characteristics, waiting time distribution. Introduction of Model II (M/M/I): $(< \infty >> / SIRO)$**.**

BOOKS SUGGESTED

Gupta, B.N.: Statistics (Theory and Practical), Sahitya Bhawan, Agra.

Saini, Yashpan and Fiedman: Operation Research Methods and Problems, Hohn Wiley and Sons, New York.

Goon, Gupta, Dasgupta: Fundamentals of Statistics, Vol. II

Grant, E.L.: Statistical Quality Control, Mc-Graw Hill, New York.

B.Sc/B.A. Part III Examination 2024
Statistics

Total Marks: 50   **Time: 03:00 Hrs.**

Paper III
Designs of Experiments and Non-Parametric Tests

Note: Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C.
Section A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 1 mark.

Section B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 3.5 marks.

Section – C: Will consist of total 05 questions one from each unit. The paper setter will set one question from each Unit and Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 7.5 marks.

Unit 1 : Analysis of variance, one way and two way classification, including multiple but equal number of observations per cell.

Unit 2 : The completely randomized design, Randomized block design, comparison of RBD with CRD, Lay-out of RBD.

Unit 3 : The latin square design, its layout and analysis. Factorial experiments, the main effects and interactions layout and its analysis (in 2^2 and 2^3 carried out in a RBD only).

Unit 4 : Non-parametric Tests: Order Statistics Cumulative and probability distribution function of a Single Order Statistics, expectation of function of order statistics. Non-parametric methods and advantages and disadvantages, Power efficiency, Sign test (Simple, for paired observations), Run test for randomness.

Unit 5 : Wilcoxon signed Rank test, Median Test, Mann-Whitney Wilcoxon U-Test, Wald-wolfowitz Run test (two sample problem), Kolmogorov-Smirnov Goodness of fit test.

BOOKS SUGGESTED

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons, Delhi.
Goon, Gupta, Dasgupta: Fundamentals of Statistics, Vol. II, World Press, Calcutta.
Rahatgi, V.: Statistical Inference, Wiley.

Statistics

PRACTICAL

The students will be asked to attempt three exercises out of five exercises. The distribution of marks will be as follows:

	Regular Students	Ex-Students
(a) Three Practical exercise	45 Marks	45 Marks
(b) Practical record work	10 Marks	-
(c) Viva-Voce	20 Marks	20 Marks
Total	75 Marks	65 Marks*

*To be converted out of 75 marks.

The following topics are prescribed for practical works:

01. Analysis of variance: One way and two way classifications.

02. Analysis of (i) completely randomized (ii) randomized block and latin square designs, factorial experiments.

03. Practical on SQC (Covered in Paper III).

04. Test of significance based on normal, X^2, t and F tests, power curve.

05. Practical on Non-Parametric Tests (covered in Paper – III).

06. 'Working knowledge of SPSS Package'.