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I B.Sc Statistics (for 2022-25 batch, w.e.f 2020-21)
Paper I, Syllabus for I semester

Descriptive Statistics

UNIT-I

Introduction to Statistics: Importance of Statistics. Scope of Statistics in different fields. Concepts of primary and secondary data. Diagrammatic and graphical representation of data: Histogram, frequency polygon, Ogives, Pie. Measures of Central Tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean. Median and Mode through graph.

UNIT-II

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non-Central moments and their interrelationship. Sheppard's correction for moments. Skewness and kurtosis.

UNIT-III

Curve fitting: Bi- variate data, Principle of least squares, fitting of degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, fitting of power curve and exponential curves.

Correlation: Meaning, Types of Correlation, Measures of Correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Bi-variate frequency distribution, correlation coefficient for bi-variate data and simple problems.

UNIT-IV

Regression : Concept of Regression, Linear Regression: Regression lines, Regression coefficients and it's properties, Regressions lines for bi-variate data and simple problems. Correlation vs regression. Concept of multiple and partial correlation coefficients (three variables only) and properties

Additional input: - Correlation Ratio and properties.

UNIT-V

Attributes : Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only , Independence of attributes , Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of MathematicalStatistics,Sultan Chand & Sons, NewDelhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy
   - Dr M.Jaganmohan Rao,Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.
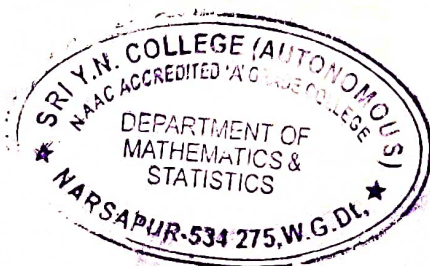3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume – I,Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishinghouse.
4. M. JaganMohan Rao and Papa Rao: A Text book of StatisticsPaper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi

Practicals - Paper – I

1. Graphical presentation of data (Histogram, frequency polygon,Ogives).
2. Diagrammatic presentation of data (Bar andPie).
3. Computation of measures of central tendency(Mean, Median andMode)
4. Computation of measures of dispersion(Q.D, M.D andS.D)
5. Computation of non-central, central moments, $\beta 1$ and $\beta 2$ for ungroupeddata.
6. Computation of non-central, central moments, $\beta 1$ and $\beta 2$ and Sheppard's corrections for groupeddata.
7. Computation of Karl Pearson's coefficients of Skewness and Bowley's coefficients ofSkewness.
8. Fitting of straight line by the method of leastsquares
9. Fitting of parabola by the method of leastsquares
10. Fitting of power curve of the type by the method of leastsquares.
11. Fitting of exponential curve of the type and by the method of leastsquares.
12. Computation of correlation coefficient and regression lines for ungroupeddata
13. Computation of correlation coefficient, forming regression lines for groupeddata
14. Computation of Yule's coefficient ofassociation
15. Computation of Pearson's, Tcherprows coefficient ofcontingency

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

Time: 3Hrs.

Max. Marks:75

PART-I(5 x 5 = 25 M)

Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit - III	: 2 questions
Unit - IV	: 1 question
Unit - V	: 1 question

PART-II(5 x 10 M= 50 M)

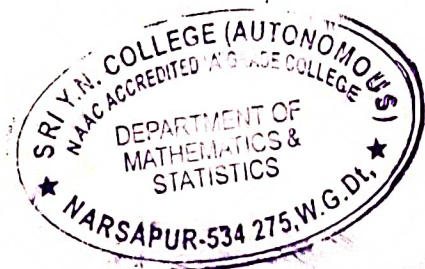**Answer any FIVE questions. Choosing atleast TWO questions from each section.**

Each question carries 10 marks.

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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Recognized by UGC as 'College with potential for Excellence'
I B.Sc. Statistics – Semester – I
Paper I - Descriptive Statistics
Model Question Paper (Theory) (for 2022-25 batch w. e. f 2020-2021)

Time: 3Hrs   Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25M

1. Distinguish between primary data and secondary data.
2. Write the good features of measures of central tendency.
3. Define Standard Deviation and write the merits and demerits.
4. Explain about Sheppard's corrections.
5. Write the procedure for fitting the power curve.
6. Define Partial and Multiple correlation coefficients.
7. Define Regression and regression coefficients.
8. Write down the conditions for the consistency of data for 2 attributes.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. Define Questionnaire. Explain different methods of Primary Data Collection.
10. Explain about measures of central tendency.
11. Derive the central moments in terms of non central moments.
12. Explain about Skewness and Kurtosis then prove that $\beta_2 \geq 1$.
13. State and prove that Karl Pearson Correlation Coefficient is independent of change of origin and scale.

SECTION – B

14. Write the procedure for fitting of second degree parabola.
15. Derive the two regression lines of y on x and x on y.
16. Calculate the regression equation of Y on X for the following data.

X	6	2	10	4	8
Y	9	11	5	8	7

17. Define Yule's coefficient of colligation and association and derive the relation between them.

18. Explain about the 2x2 contingency table and Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

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I B.Sc. Statistics – Semester – II
Paper II - **Probability and Probability Distributions**
(for 2022-25 batch w. e. f 2020-2021)

UNIT-I: Introduction to Probability: (Shorts -2, Essays– 2)

Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorem and its applications in real life problems.

UNIT-II: Random variable: (Shorts -1, Essays– 2)

Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. For given pmf, pdf calculation of moments, coefficient of skewness and kurtosis. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

UNIT – III :Mathematical expectation : (Shorts -2, Essays– 2)

Mathematical expectation of a random variable and function of a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F and their properties. Chebyshev and Cauchy - Schwartz inequalities.

UNIT – IV : Discrete Distributions: (Shorts -2, Essays– 2)

Binomial, Poisson, Negative Binomial, Geometric distributions: Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, additive property if exists. Poisson, approximation to Binomial distribution. Hyper-geometric distribution: Defination, mean and variance.

UNIT – V : Continuous Distributions: (Shorts -1, Essays– 2)

Rectangular, Exponential, Gamma, Beta, and Distributions: mean, variance, M.G.F, C.G.F, C.F. **Normal Distribution**: Definition, Importance, Properties, M.G.F, CF, additive property. **Additional inputs:** Cauchy distribution and its C.F

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of MathematicalStatistics,SultanChand & Sons, NewDelhi.

2 BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy

- Dr M.Jaganmohan Rao, Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd.,Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishinghouse.
4. M. JaganMohan Rao and Papa Rao: A Text book of StatisticsPaper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition.Pearson.

Practicals Paper – II

1. Fitting of Binomial distribution – Directmethod.
2. Fitting of binomial distribution – Recurrence relationMethod.
3. Fitting of Poisson distribution – Directmethod.
4. Fitting of Poisson distribution - Recurrence relationMethod.
5. Fitting of Negative Binomialdistribution.
6. Fitting of Geometricdistribution.
7. Fitting of Normal distribution – Areasmethod.
8. Fitting of Normal distribution – Ordinatesmethod.
9. Fitting of Exponentialdistribution.
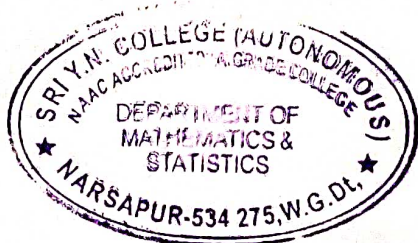
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SEMESTER-I
BLUE PRINT

Time: 3Hrs.   Max. Marks: 75

PART-I(5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2 questions
Unit - II	: 1 question
Unit - III	: 2 questions
Unit - IV	: 2 questions
Unit - V	: 1 question

PART-II(5 x 10 M= 50 M)
Answer any FIVE questions. Choosing at least TWO questions from each section.

Each question carries 10 marks.

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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I B.Sc. Statistics – Semester – II

Paper II - **Probability and Probability Distributions**

Model Question Paper (Theory) (for 2022-25 batches w. e. f 2020-2021)

Time: 3Hrs   Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25M

1. State and prove Baye's theorem of Probability.

2. Define Distribution function and write its properties.

3. State and prove Cauchy Schwartz's inequality.

4. State and prove the additive property of Poisson distribution.

5. Derive the area property of Normal distribution.

6. Derive the mean and variance of geometric distribution.

7. Define mutually exclusive and equally likely events.

8. Define mathematical Expectation and Prove that $V(aX+b) = a^2 V(X)$.

PART-II

Answer any FIVE questions. Choosing at least TWO questions from each section.

Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. State and prove Boole's inequality.

10. State and prove the Addition theorem of probability for n events.

11. Define Bivariate Random Variable. Joint distribution of X and Y is given by

    f(x,y) = 4xy

    Test whether X and Y are independent. For the above joint distribution, find the conditional density of X given Y=y.

12. A random variable X has the following probability distribution:

X:	1	2	3	4	5	6	7
P(X):	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

13. State and prove Chebyshev's inequality.

SECTION - B

14. Define Moment Generating Function and state and prove the properties of it.

15. Derive the first four central moments of Binomial Distribution.

16. Define Negative binomial distribution and derive the mean and variance of Negative binomial distribution.

17. Prove that for Normal distribution QD : MD : SD :: 10 : 12 : 15

18. Define Beta distribution of first kind and derive the mean and variance
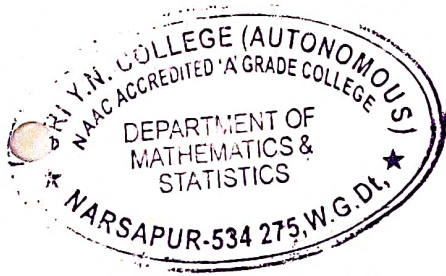
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II B.Sc. Statistics – Semester - III
Paper III - STATISTICAL INFERENCE
(for 2021-24 batch w. e. f 2021-2022)

UNIT-I : (Shorts -2, Essays– 2)

Concepts: Population, Sample, Parameter, statistic, Sampling distribution, Standard error. Convergence in probability and convergence in distribution, law of large numbers, and central limit theorem (statements only). Student's t- distribution, F – Distribution, χ^2- Distribution: Definitions, properties and their applications.

UNIT-II : (Shorts -2, Essays– 2)

Theory of estimation : Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, &sufficiency and. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Binomial, Poisson &Normal Population parameters estimate by MLE method. Confidence Intervals.

UNIT-III : (Shorts -1, Essays– 1)

Testing of Hypothesis : Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

UNIT – IV : (Shorts -2, Essays– 2)

Large sample Tests: large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. Standard deviation and correlation coefficient(s).
Small Sample tests: t-testforsinglemean,differenceofmeansandpairedt-test.χ^2-testforgoodness of fit and independence of attributes. F- test for equality of variances.

UNIT – V : (Shorts -1, Essays– 1)

Non-parametric tests_- Their advantages and disadvantages, comparison with parametric tests. Measurement scale- nominal, ordinal, interval and ratio. One sample runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test.

TEXT BOOKS:

1. BA/BSc II year statistics - statistical methods and inference - Telugu Academy by A.Mohanrao, N.Srinivasa Rao, Dr R.Sudhakar Reddy, Dr T.C. RavichandraKumar.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC.PHI.

REFERENCE BOOKS:
1. Fundamentals of Mathematics statistics : VK Kapoor and SCGuptha.
2. Outlines of statistics, Vol II : Goon Guptha, M.K.Guptha, Das GupthaB.
3. Introduction to Mathematical Statistics : HoelP.G.
4. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition.Pearson.

PRACTICALS - PAPER –III

1. Large sample test for singlemean
2. Large sample test for difference ofmeans
3. Large sample test for singleproportion
4. Large sample test for difference ofproportions
5. Large sample test for difference of standarddeviations
6. Large sample test for correlationcoefficient
7. Small sample test for singlemean
8. Small sample test for difference ofmeans
9. Small sample test for correlationcoefficient
10. Paired t-test(pairedsamples).
11. Small sample test for single variance($\chi 2$ - test)
12. Small sample test for difference ofvariances(F-test)
13. $\chi 2$ - test for goodness of fit and independence ofattributes
14. Nonparametric tests for single sample(run test, sign test and Wilcoxon signed ranktest)
15. Nonparametric tests for related samples (sign test and Wilcoxon signed ranktest)
16. Nonparametric tests for two independent samples (Median test, Wilcoxon –Mann- Whitney - U test, Wald - Wolfowitz' s runstest)

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writinginferences.
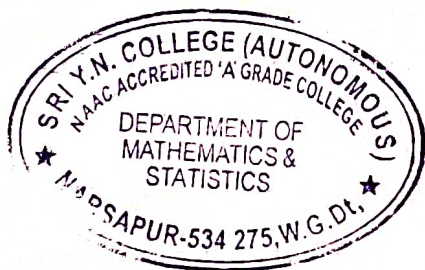
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SEMESTER-III
PAPER-III
BLUE PRINT

Time: 3Hrs.   Max.Marks:75

PART-I (5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

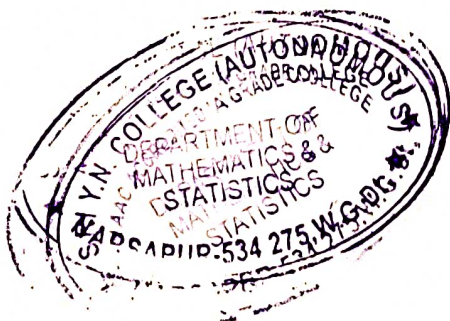|	
Unit - I	: 2 question
Unit - II	: 2 questions
Unit - III	: 1 question
Unit - IV	: 2questions
Unit - V	: 1 question

PART-II (5 x 10 M= 50 M)
Answer any FIVE questions. Choosing at least TWO questions from each section.
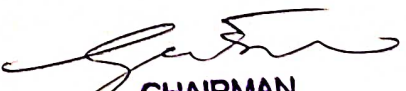**Each question carries 10 marks.**

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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II B.Sc. Statistics – Semester - III

Paper III - Statistical Inference

Model Question Paper (Theory) (for 2020-23 batches w. e. f 2021-2022)

Time: 3Hrs   Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25M

1. Explain about parameter and statistic.
2. Derive the relation between t and F distributions.
3. Explain about the confidence intervals.
4. State the Neymann's Factorization theorem.
5. Explain about the Types of errors.
6. Write the procedure for paired t test.
7. Write the procedure for testing single proportion in large samples.
8. Write the advantages and disadvantages of Non parametric tests.

PART-II

Answer any FIVE questions. Choosing at least TWO questions from each section.
Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. Define F distribution and write the properties and applications of the distribution.
10. Derive the relation between F and Chi- square distributions.
11. Explain the criteria of good estimator.
12. State and prove Cramer Rao's inequality.
13. State and prove Neymann Pearson Lemma.

SECTION - B

14. Obtain the Best critical Region for Binomial Distribution.
15. Write the procedure for testing two means in large samples.
16. Write the procedure for testing the two variances.
17. Explain about the median test for two samples.
18. Explain about the Wilcoxon Signed rank test for two samples.
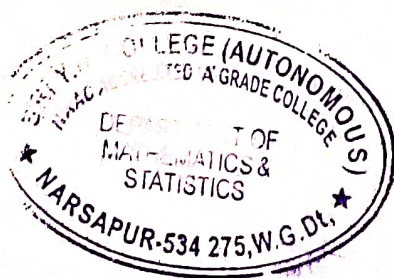
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II B.Sc. Statistics – Semester - IV

Paper IV: Sampling Techniques and Designs of Experiments
(for 2021-24 batch w. e. f 2021-2022)

UNIT-I: (Shorts -2, Essays– 2)

Simple Random Sampling (with and without replacement): Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size, simple random sampling of attributes.

UNIT II: (Shorts -2, Essays– 2)

Stratified Random Sampling: Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

Systematic sampling: Systematic sampling definition when $N = nk$ and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR.

UNIT III : (Shorts -2, Essays– 2)

Analysis of variance : Analysis of variance(ANOVA) –Definition and assumptions. One-way with equal and unequal classification, Two way classification.

Design of Experiments: Definition, Principles of design of experiments, CRD: Layout, advantages and disadvantage and Statistical analysis of Completely Randomized Design(C.R.D).

UNIT IV : (Shorts -1, Essays– 1)

Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts and Analysis, Missing plot technique in RBD and LSD .Efficiency RBD over CRD ,Efficiency of LSD over RBD and CRD.

UNIT V : (Shorts -1, Essays– 1)

Factorial experiments – Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals.

Text Books:

1. Telugu AcademyBA/BSc III year paper - III Statistics - applied statistics - Telugu academy

   by Prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.PapaiahSastry.

2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC,PHI.

Reference Books:

1. Fundamentals of applied statistics : VK Kapoor and SCGupta.

2. Indian Official statistics - MR Saluja.

3. Anuvarthita Sankyaka Sastram - TeluguAcademy   .

Practicals - Paper –IV

Sampling Techniques:

Estimation of population mean and its variance by

1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with N=nk. Comparison of systematic sampling with Stratified andSRSWOR.

Design of Experiments:

4. ANOVA - one - way classification with equal and unequal number of observations
5. ANOVA Two-way classification with equal number of observations.
6. Analysis ofCRD.
7. Analysis of RBD Comparison of relative efficiency of CRD with RBD
8. Estimation of single missing observation in RBD and itsanalysis
9. Analysis of LSD and efficiency of LSD over CRD andRBD
10. Estimation of single missing observation in LSD and itsanalysis
11. Analysis of 2^2 with RBD layout
12. Analysis of 2^3 with RBDlayout

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writinginferences.
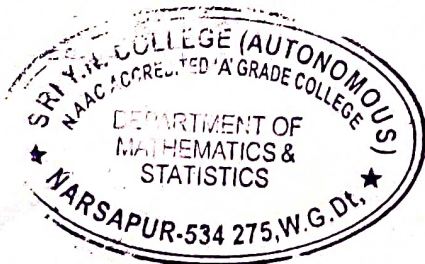
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NARSAPUR - 5

Time: 3Hrs.

Max.Marks:75

PART-I (5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2question
Unit - II	: 2 questions
Unit - III	: 2 question
Unit - IV	: 1 questions
Unit - V	: 1 questions

PART-II (5 x 10 M= 50 M)
Answer any FIVE questions. Choosing at least TWO questions from each section.

Each question carries 10 marks.

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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II B.Sc. Statistics – Semester - IV

Paper IV: Sampling Techniques and Designs of Experiments

Model Question Paper (Theory) (for 2021-24 batches w. e. f 2021-2022)

Time: 3Hrs   Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks.   **5x5M =25M**

1. Explain about the sampling errors.
2. In SRSWOR prove that sample mean is an unbiased estimator of population mean.
3. Write down the advantages and disadvantages of simple random sampling.
4. Define proportional and optimum allocation.
5. State the Cochran's theorem.
6. Explain the about the local control.
7. Explain about the efficiency of RBD over CRD.
8. Explain about the factorial experiments.

PART-II

Answer any FIVE questions. Choosing at least TWO questions from each section.
Each question carries 10 marks.   **5x10M = 50M**

SECTION – A

9. Explain the various steps involved in sampling survey.
10. In SRSWOR prove that

$$V\,(\overline{y}) = \frac{N-n}{Nn}\,S^2$$

11. Prove that $V(\overline{y_{st}}) = \frac{N-n}{Nn}\,\Sigma p_i s_i^2$

12. Define stratified random sampling and systematic random sampling.
    With usual notations prove that

    $$V_{opt} < V_{prop} < V_{ran}$$

13. Explain the ANOVA one way classification.

SECTION - B

14. Explain about the statistical analysis of two way classification with merits and demerits.
15. Explain about the layout and statistical analysis of RBD.
16. Explain the missing plot technique in LSD.
17. Explain the 2^3 factorial experiments with statistical analysis.
18. Explain the statistical analysis of 2^2 factorial experiments.

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II B.Sc. Statistics – Paper IV

Paper V: APPLIED STATITICS
(for 2021-24 batch w. e. f 2021-2022)

UNIT I: (Shorts -2, Essays– 2)

Time Series : Time Series and its components with illustrations, additive, multiplicativemodels. Trend: Estimation of trend by free hand curve method, method of semi averages.Determination of trend by least squares (Linear trend, parabolic trend only), moving averages method.

UNIT II: (Shorts -2, Essays– 1)

Seasonal Components: Determination of seasonal indices by simple averages method, ratio to moving average, Ratio to trend and Link relative methods, Deseasonalization.

UNIT III: (Shorts -2, Essays– 1)

Growth curves: Modified exponential curve, Logistic curve and Grompertz curve, fitting of growth curves by the method of three selected points and partial sums.Detrending. Effect of elimination of trend on other components of the time series

UNIT IV: (Shorts -2, Essays– 2)

Index numbers: Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and weighted index numbers. Laspayer's, Paasche's and Fisher's index numbers, Criterion of a good index number, Fisher's ideal index numbers. Cost of living index number and wholesale price index number.

UNIT V: (Shorts -2, Essays– 2)

Vital Statistics: Introduction, definition and uses of vital statistics, sources of vital statistics.

Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.

Additional inputs :- Abridged life tables

Text Books:
1. Fundamentals of applied statistics : VK Kapoor and SCGupta.
2. BA/BSc III year paper - III Statistics - applied statistics - Telugu academy by prof.K.Srinivasa Rao, Dr D.Giri. Dr A.Anand, Dr V.PapaiahSastry.
3. Mukopadhyay, P (2011). Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
4. Brockwell, P.J. and Devis, R.A. (2003). Introduction to Time Series Analysis. Springer.
5. Chatfield, C. (2001). Time Series Forecasting., Chapman & Hall.
6. Srinivasan, K. (1998). Demographic Techniques and Applications. Sage Publications
7. Srivastava O.S. (1983). A Text Book of Demography. Vikas Publishing House

Practical Paper –V

...rement of trend by method of moving averages(odd and evenperiod)

...easurement of trend b method of Least squares(linear andparabola)

ɔ. Determination of seasonal indices by method simpleaverages

4. Determination of seasonal indices by method of Ratio to movingaverages

5. Determination of seasonal indices by method of Ratio totrend

6. Determination of seasonal indices by method of Linkrelatives

Index Numbers:

7. Computation of simple indexnumbers.

8. Computation of all weighted index numbers.

9. Computation of reversaltests.

Vital Statistics:

10. Computation of various Mortalityrates

11. Computation of various Fertilityrates

12. Computation of various Reproductionrates.

13. Construction of LifeTables

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writinginferences.

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Time: 3Hrs.

Max.Marks:75

PART-I (5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2question
Unit - II	: 1 questions
Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

PART-II (5 x 10 M= 50 M)
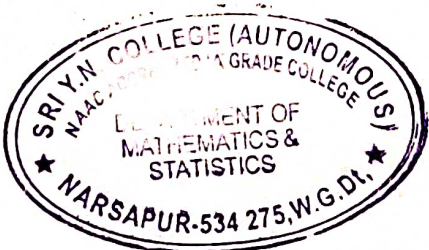**Answer any FIVE questions. Choosing at least TWO questions from each section.**

Each question carries 10 marks.

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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II B.Sc. Statistics – Paper V

Paper V: APPLIED STATISTICS

Model Question Paper (Theory) (for 2020-23 batches w. e. f 2020-2021)

Time: 3Hrs   Max Marks: 75

PART-I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25

1. Explain the different models on time series.
2. Explain the method of semi averages to estimate the trend.
3. Explain the method of simple averages to find seasonal indices.
4. Explain the Gompertz curve.
5. Explain about the whole sale price index number.
6. Define Laspayer's and Paasche's price index numbers.
7. Define Gross reproduction rate.
8. Write the applications of Vital statistics.

PART-II

Answer any FIVE questions. Choosing at least TWO questions from each section. Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. Define time series and explain the components of time series.
10. Fit a second degree parabola to the following data and obtain trend values.

| Year sales in	2002	2003	2004	2005	2006
1000rs	10	12	13	10	8

11. Explain the link relative method to find seasonal indices with merits and demerits.
12. Explain the ratio to trend method to find seasonal indices with merits and demerits.
13. Explain the Logistic curve with properties.

SECTION – B

14. Fit a Gompertz curve to the following data by the method of partial sums and obtain the trend values

Year	1	2	3	4	5	6	7	8	9
Population(millions)	2.4	3.2	5.5	30.4	50.5	63.1	70.3	72.4	73.3

15. Define index number and explain what are the problems involved in construction of index numbers.
16. Explain the various price and quantity index numbers.
17. Define life table and explain the components of life table.
18. Define vital statistics, write the uses and explain the sources of vital statistics.
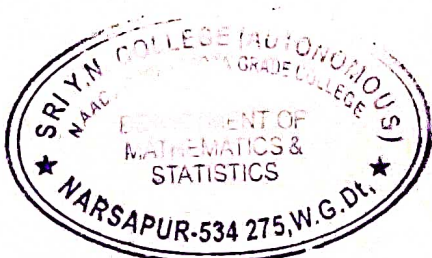
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OPERATIONS RESEARCH – I
(for 2020-23 batch, w.e.f 2022-23)

UNIT-I

Introduction of OR – Origin and development of OR – Nature and features of OR –Scientific Method in OR – Modeling in OR – Advantages and limitations of Models-General Solution methods of OR models – Applications of Operation Research. Linear programming problem (LPP) -Mathematical formulation of the problem - illustrations on Mathematical formulation of linear programming of problem. Graphical solution of linear programming problems. Some exceptional cases - Alternative solutions, unbounded solutions, non-existing feasible solutions by Graphical method.

UNIT-II

General linear programming problem (GLP) – Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case)

UNIT-III

Artificial variable technique - Big-M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

UNIT-IV

Duality in Linear Programming –Concept of duality -Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Economic interpretation of duality, Relation between the solution of Primal and Dual problem(statements only). Using duality to solve primal problem. Dual Simplex Method.
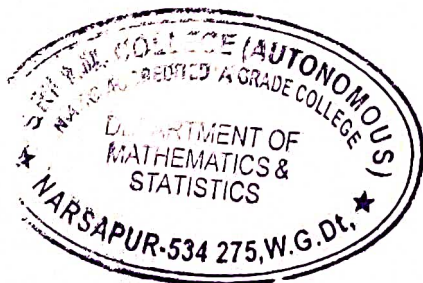
UNIT-V

Post Optimal Analysis- Changes in cost Vector **C**, Changes in the Requirement Vector **b** and changes in the Coefficient Matrix **A**. Structural Changes in a LPP.

Reference Books:

1. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K.Gupta, Manmohn, Operations Research, Sultan Chand and sons, New Delhi.
3. J.K. Sharma, Operations Research and Application, Mc.Millan and Company, New Delhi.
4. GassS.I: Linear Programming. Mc Graw Hill.
5. HadlyG : Linear programming. Addison-Wesley.
6. Taha H.M: Operations Research: An Introduction : Mac Millan.

Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem using Graphical Method with
   - (i) Unbounded solution
   - (ii) Infeasible solution
   - (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charne's M - method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   - (i) Unrestricted variables
   - (ii) Unbounded solution
   - (iii) Infeasible solution
   - (iv) Alternative or multiple solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.
8. Problems based on Post Optimal Analysis.

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Time: 3Hrs.   Max. Marks: 75

PART-I(5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit - III	: 2 questions
Unit - IV	: 1 question
Unit - V	: 1 question

PART-II(5 x 10 M= 50 M)
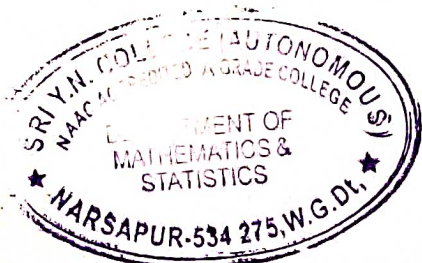**Answer any FIVE questions. Choosing atleast TWO questions from each section.**
Each question carries 10 marks.

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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III B.Sc. Statistics – Semester – V
Paper VI – Operations research - I
Model Question Paper (Theory) (for 2020-23 batch w. e. f 2022-2023)

Time: 3Hrs

Marks: 75   Max

Part - I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25M

1. Define OR and explain the origin of OR

2. Write the procedure for Graphical solution of LPP.

3. Define slack and surplus variables.

4. Write the general form of linear programming problem.

5. Define artificial variable technique.

6. Explain about the degeneracy in LPP

7. Write the procedure for changing the primal into dual LPP.

8. Explain about sensitivity analysis.

PART-II

Answer any FIVE questions. Choosing atleast TWO questions from each section.
Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. Explain the advantages and limitations of OR.

10. Explain the mathematical form of LPP. A company produces 3 products P.Q & R from three raw materials A,B & C. one unit of product P required 2 units of A & 3 units of B. One unit of product Q requires 2 units of B & 5 units of C. One unit of product R required 3 units of A, 2 units of B and 4 units of C. The company has 8 units of material A, 10 units of material B and 15 units of material C. Profits as per unit of products P,Q,R are Rs.3/-, Rs.5/- and Rs.4/- respectively. Formulate the given problem as LPP.

11. Write the procedure for Simplex method.

12. Use Simplex method to solve the following LPP

     Max $Z = 7x_1 + 5x_2$

       Subject to the constraints

     $x_1 + 2x_2 \leq 6$

     $4x_1 + 3x_2 \leq 12$

     and $x_1 , x_2 \geq 0$

13. Write the procedure for Two Phase simplex method.

SECTION – B

14. Use Charnes Penalty method and Big – M method to solve the following LPP.

   Min $Z = 2x_1 + x_2$
   Subject to the constraints
   $3x_1 + x_2 = 3$
   $4x_1 + 3x_2 \geq 6$
   $x_1 + 2x_2 \leq 3$
   and $x_1, x_2 \geq 0$

15. Write the rules for converting the primary into its dual with suitable example

16. Obtain dual of the following LPP

   Minimize $Z = x_1 - 2x_2 + 3x_3$

   Subject to

   $3x_1 + x_2 - 2x_3 \leq 7$

   $2x_1 + 4x_2 \geq 12$

   $4x_1 - 3x_2 + 8x_3 = 10$

   $x_1, x_2, x_3 \geq 0$

17. Write the procedure for changing in objective function coefficient.

18. Solve the following LP problem

   Max $Z = 3x_1 + 5x_2$
   Sub to
   $3x_1 + 2x_2 \leq 18$
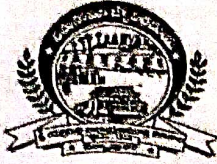 $x_1 \leq 4$
   $x_2 \leq 6$
   $x_1, x_2 \geq 0$

   a) Determine an optimal solution to the problem.
   b) Discuss the change in cj on the optimality of the optimal basic fasible solution.

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OPERATIONS RESEARCH – II

UNIT -I

Transportation Problem- Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem- North-West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution-MODI method(U-V method). Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization TP. Transshipment Problem.

UNIT-II

Assignment Problem -Introduction, Mathematical formulation of Assignment problem, Reduction theorem (statement only), Hungarian Method for solving Assignment problem, Unbalanced Assignment problem. The Traveling salesman problem, Formulation of Traveling salesman problem as an Assignment problem and Solution procedure.

UNIT-III

Sequencing problem: Introduction and assumptions of sequencing problem, Sequencing of n jobs and one machine problem. Johnson's algorithm for n jobs and two machines problem-problems with n-jobs on two machines, Gantt chart, algorithm for n jobs on three machines problem- problems with n- jobs on three machines, algorithm for n jobs on m machines problem, problems with n-jobs on m-machines. Graphical method for two jobs on m–machines.

UNIT-IV

Network Scheduling: Basic Components of a network, nodes and arcs, events and activities– Rules of Network construction – Time calculations in networks - Critical Path method (CPM) and PERT.

UNIT –V

Game Theory: Two-person zero-sum games. Pure and Mixed strategies. Maxmin and Minimax Principles - Saddle point and its existence. Games without Saddle point-Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property. Matrix oddment method for n x n games. Only formulation of Linear Programming Problem for m x n games.

Reference Books:

1. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P.K. Gupta, Manmohan, Operations Research, Sultan Chand and sons, New Delhi.
3. J.K. Sharma, Operations Research and Application, Mc. Millan and Company, New Delhi.
4. Gass: Linear Programming. Mc Graw Hill.
5. Hadly : Linear programming. Addison-Wesley.
6. Taha : Operations Research: An Introduction : Mac Millan.
7. Dr.NVS Raju; Operations Research, SMS education,

Practical/Lab to be performed on a computer using OR/Statistical packages

1. IBFS of transportation problem by using North- West corner rule, Matrix minimum method and VAM
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases)
3. Solution of Assignment problem using Hungarian method (both maximization and minimization cases)
4. Solution of sequencing problem - processing of n jobs through two machines
5. Solution of sequencing problem - processing of n jobs through three machines
6. To perform Project scheduling of a given project (Deterministic case-CPM).
7. To perform Project scheduling of a given project (Probabilistic case-PERT).
8. Graphical method of solving for m x 2 and 2 x n games.
9. Solution of m x n games by dominance rule.
10. Solution of n x n games by using matrix oddment method.
11. Linear programming method for solving m x n games.

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SEMESTER-V
BLUE PRINT

Time: 3Hrs.   **Max. Marks: 75**

PART-I(5 x 5 = 25 M)
Answer any FIVE Questions, each question carries FIVE marks.

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit - III	: 1 question
Unit - IV	: 1 question
Unit - V	: 2 question

PART-II(5 x 10 M= 50 M)
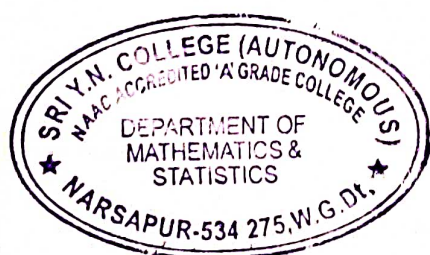**Answer any FIVE questions. Choosing atleast TWO questions from each section.**
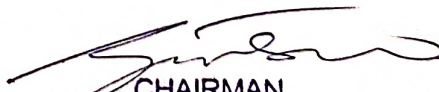**Each question carries 10 marks.**

SECTION-A

Unit - I	: 2 questions
Unit - II	: 2 questions
Unit – III	: 1 question

SECTION-B

Unit - III	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

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III B.Sc. Statistics – Semester – V
Paper VI – Operations research - II
Model Question Paper (Theory) (for 2020-23 batch w. e. f 2022-2023)
Max Marks: 75

Time: 3Hrs

Part - I

Answer any FIVE Questions, each question carries FIVE marks.   5x5M =25M

1. Define Transportation problem.

2. Write the procedure of North –west corner rule.

3. Explain about the unbalanced Assignment problem.

4. Write the procure for travelling salesman problem.

5. Explain about the job sequencing problem.

6. Explain about Network problem.

7. Define Saddle Point and maxi min and mini max principle.

8. Explain about the graphical method of solving Game.

PART-II

Answer any FIVE questions. Choosing at least TWO questions from each section. Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. Write the procedure of MODI method for solving Transportation problem.

10. Determine the initial basic feasible solution to the following transportation problem by VAM method.

DESTINTION

SOURCE	D₁	D₂	D₃	D₄	SUPPLY
S₁	21	16	15	3	11
S₂	17	18	14	23	13
S₃	32	27	18	41	19
DEMAND	6	10	12	15	

11. Explain the Hungarian method of solving Assignment problem.

12. Five men are available to do five different jobs. From past records the time (in hours) that each man takes to do each job is known and is given in the following table.

		Jobs				
		I	II	III	IV	V
Men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

13. Explain sequential procedure for solving 2 machines 'n' jobs problem.

SECTION – B

14. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines is given in hours and passing is not allowed.

Job	A	B	C	D	E	F	G
Machine M1	3	8	7	4	9	8	7
Machine M2	4	3	2	5	1	4	3
Machine M3	6	7	5	11	5	6	12

15. Write the procedure for critical path analysis.

OR

16. The following details are available regarding a project

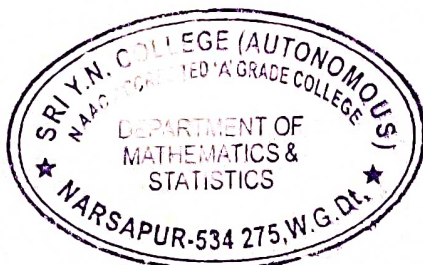| Activity	A	B	C	D	E	F
Predecessor Activity	-	A	A	B	C	D, E
Duration(week)	3	5	7	10	5	4

Draw the network, determine the Critical Path and find the project completion time

17. Write the procedure for solving games by dominance property.

OR

18. Solve the following game using the method of dominance

		Player B			
		B_1	B_2	B_3	B_4
	A_1	4	2	3	6
Player A	A_2	3	4	7	5
	A_3	6	3	5	4