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I B.Sc Statistics (for 2021-24 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. Concept of multiple and partial correlation coefficients (three variables only) and properties

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.

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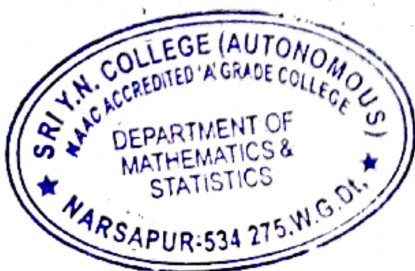3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

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
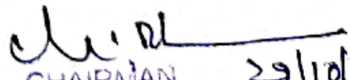
Credits 2

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.

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SRI Y.N. COLLEGE (AUTONOMOUS)
NAAC ACCREDITED 'A' GRADE COLLEGE
NARSAPUR-534 275,W.G.Dt.

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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I B.Sc. Statistics – Semester – I

Paper I - Descriptive Statistics

Model Question Paper (Theory) (for 2021-24 batch w. e. f 2020-2021)

Max Marks: 75

Time: 3Hrs

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 2021-24 batch w. e. f 2020-2021)

Course Learning Outcomes

Students will acquire

1) Ability to distinguish between random and non-random experiments,

2) Knowledge to conceptualize the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem,

3) Knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments,

4) Knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions,

(e) Acumen to apply standard discrete and continuous probability distributions to different situations.

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. Possion approximation to Binomial distribution. Hyper-geometric distribution: Defination, mean and variance.

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

Rectangular, Exponential, Gamma, Beta Distributions: mean , variance, M.G.F, C.G.F, C.F.
Normal Distribution: Definition, Importance, Properties, M.G.F, CF, additive property.

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
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5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition.Pearson.

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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
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Max. Márks: 75

Time: 3Hrs.

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.
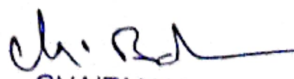
Each question carries 10 marks.

SECTION-A

Unit - I : 2 questions

Unit - II : 2 questions

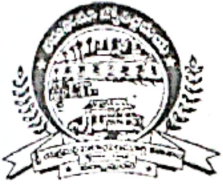Unit – III : 1 question

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 2021-24 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:

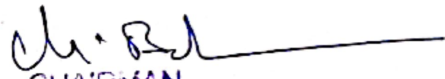| X:	1	2	3	4	5	6	7
P(X):	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

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 2020-23 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).

SmallSampletests:t-testforsinglemean,differenceofmeansandpairedt-test.$\square$2-testforgoodness of fit and independence of attributes. F-test for equality ofvariances.

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.
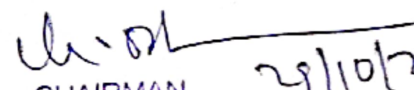
TEXT BOOKS:

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.

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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.

Course Learning Outcomes

The students will acquire

1) Concept of law large numbers and their uses
2) Concept of central limit theorem and its uses in statistics
3) concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions,
4) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts,
5) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations,
6) concept about non-parametric method and some important non-parametric tests.

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

:s:75

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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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 2020-23 batch w. e. f 2021-2022)

Course Learning Outcomes
The students shall get
1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
2) An idea of conducting the sample surveys and selecting appropriate sampling techniques,
3) Knowledge about comparing various sampling techniques.
4) Carry out one way and two way Analysis of Variance,
5) Understand the basic terms used in design of experiments,
6) Use appropriate experimental designs to analyze the experimental data.

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, MissingplottechniqueinRBDandLSD.EfficiencyRBDoverCRD,EfficiencyofLSDoverRBDand 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.

SEMESTER-IV
PAPER -IV
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	: 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)

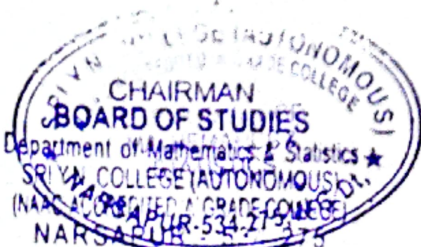Answer any FIVE questions. Choosing at least TWO questions from each section.
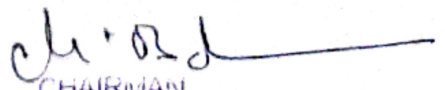
Each question carries 10 marks.

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 2020-23 batches w. e. f 2021-2022)

Time: 3Hrs   Max Marks: 75

PART-1

Answer any FIVE Questions, each question carries FIVE marks.   5x5 M =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

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

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 2020-23 batch w. e. f 2021-2022)

Course Learning Outcomes

After completion of this course, the students will know about

1) Time series data, its applications to various fields and components of time series,

2) Fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve,

3) Fitting of trend by Moving Average method,

4) Measurement of Seasonal Indices by Ratio-to-Trend , Ratio-to-Moving Average and Link Relative methods,

5) Applications to real data by means of laboratory assignments.

6) Interpret and use a range of index numbers commonly used in the business sector

7) Perform calculations involving simple and weighted index numbers

8) Understand the basic structure of the consumer price index and perform calculations involving its use

9) Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation,

10) Construction and implementation of life tables,

11) Population growth curves, population estimates and projections,

12) Real data implementation of various demographic concepts as outlined above through practical assignments.

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 Component: 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.

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

Time Series:
1. Measurement of trend by method of moving averages(odd and evenperiod)
2. Measurement of trend by method of Least squares(linear andparabola)
3. 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.
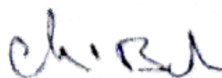8. Computation of all weighted index numbers.
9. Computation of reversaltests.

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)

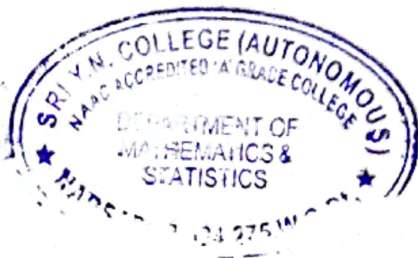**Answer any FIVE questions. Choosing at least TWO questions from each section.**

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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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.
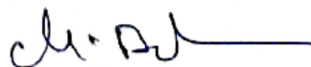13. Explain the Logistic curve with properties.

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.
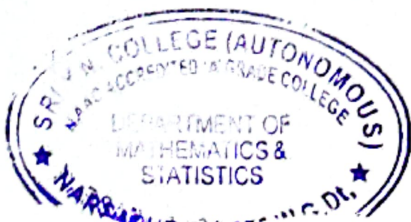
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Paper V, Syllabus for V semester

SAMPLING TECHNIQUES & DESIGN OF EXPERIMENTS

Course Learning Outcomes

The students shall get

1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.

2) An idea of conducting the sample surveys and selecting appropriate sampling techniques,

3) Knowledge about comparing various sampling techniques.

4) Carry out one way and two way Analysis of Variance,

5) Understand the basic terms used in design of experiments,

6) Use appropriate experimental designs to analyze the experimental data.

Unit-I (10 Marks-2,5 Marks-2)

Sampling Theory: Principle steps in a sample survey, Census versus Sample survey, Sampling and Non sampling errors. Types of sampling – Subjective, Probability and mixed sampling methods.

Unit-II (10 Marks-2,5 Marks-1)

Simple Random Sampling : Meaning of samples and methods to draw, estimation of population mean, variances in SRSWR & SRSWOR, Advantages and disadvantages of these methods.

Unit-III (10 Marks-2,5 Marks-2)

Stratified Random Sampling : Proportional and optimum allocation of sample sizes in stratification. Variances of these methods. Comparison of their relative efficiencies. Advantages and Disadvantages of Stratified sampling. Concept of Systematic sampling, Advantages and Disadvantages.

Unit-IV (10 Marks-2,5 Marks-1)

Analysis of Variance: Causes of variation, statement of Cochran's theorem, One – Way with equal and unequal classifications and two way classifications.

Unit-V(10 Marks-2,5 Marks-2)

Design of Experiments: Principles of Experimentation in Designs Analysis of Completely randomized design (CRD), Randomized block design (RBD) and Latin Square Design (LSD), efficiency of these designs. Concept of Factorial experiments.

Text Books:
1. Telugu Academy B.A / B.Sc III year paper – III Statistics – applied statistics – Telugu Academy by Prof. K Srinivasa Rao, Dr D Giri, Dr A Anand, Dr V Papaiah Sastry.
2. KVS Sarma : Statistics Made Simple : Do it yourself in PC. PHI

Reference books:
1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. Anuvarthita Sankyaka Sastram – Telugu Academy.
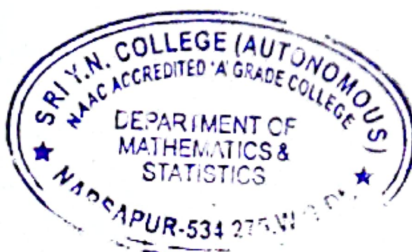
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Practicals

1. Estimation of Population mean, variance by SRSWOR
2. Estimation of Population mean, variance by SRSWR
3. ANOVA one – way classification
4. ANOVA – CRD
5. ANOVA – RBD
6. ANOVA – LSD
7. Ms – Excel methods for the about serial numbers 4,5,6 (any one)

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III B.Sc. Statistics – Paper V

SAMPLING TECHNIQUES & DESIGN OF EXPERIMENTS

Model Question Paper (Theory) (for 2019-22 batch w. e. f 2019-2020)

Max Marks: 75

Time: 3Hrs

PART-I

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

1. Explain the advantages of Sampling over census.
2. Show that the Sample Mean is an Unbiased estimate of the population mean in SRSWOR.
3. Explain the proportional allocation method in Stratified Random Sampling.
4. Explain ANOVA and its assumptions.
5. Explain about C.R.D.
6. Explain the Systematic Random Sampling.
7. Explain the concept of Factorial Experiments.
8. Explain Sampling and Non – Sampling errors.

PART-II

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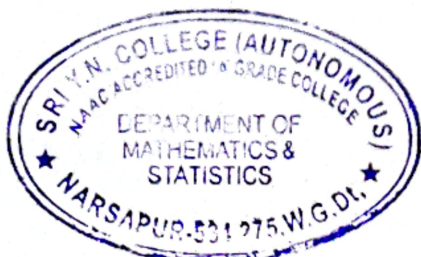Each question carries 10 marks.   5x10M = 50M

SECTION – A

9. What are the principal steps in a Sample Survey. Discuss them briefly.
10. What is the difference between Census Survey and Sample Survey.
11. Derive the Variance of the Sample mean in SRSWOR.
12. Show that the Sample mean square is an unbiased estimate of population mean square.
13. Define and explain Stratified Random Sampling. What are the advantages and disadvantages of Stratified Random Sampling.

SECTION-B

14. Define Systematic Sampling and also give the advantages and disadvantages of Systematic Sampling.
15. Explain the analysis of variance of Two –Way classification and also give ANOVA 2 – way table.
16. What is meant by ANOVA 1 – way classification. Give layout and analysis for one – way classification.
17. What is Latin Square Design (L.S.D). Give the layout and analysis of a L.S.D. Discuss its merits and demerits.
18. Explain the analysis of Randomized Block Design (R.B.D).

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

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

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

Each question carries 10 marks.

Note : Under Section –A (Q. No: 13) and Section – B (Q. No: 14) will be given from UNIT-III

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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Paper VI, Syllabus for V semester

Quality and Reliability

Course Learning Outcomes
The students shall get

1) Introduced to various statistical quality control charts like mean and range chart, fraction defective chart and number of defects chart etc.

2) An idea of constructing various control charts to control the process and product control.

3) Knowledge about various acceptance sampling plans.

4) Comparison of various sampling plans based on sample size.

5) Understand the basic terms used in statistical quality control,

6) To gain knowledge in reliability and failure rates.

Unit-I (10 Marks-2,5 Marks-2)
Importance of SQC in industry, statistical basis of shewart control charts, uses of control charts, control limits, natural tolerance limits and specification limits, concept of six – sigma.

Unit-II (10 Marks-2,5 Marks-2)
Variable Control Chart : Construction of mean, R, S.D, charts for variables, interpretation of control charts.
Attribute control charts – np, p charts, C chart, Interpretation of control charts.

Unit-III (10 Marks-2,5 Marks-1)
Acceptance Sampling Plans –Scope, Producer's risk and consumer's risk concepts of AQL and LTPD.

Unit-IV (10 Marks-2,5 Marks-1)
Sampling Plans: Single and double sampling plans, OC and ASN functions, Double and single Sampling plans for attributes using Binomial.

### Unit-V(10 Marks-2,5 Marks-2)
Reliability : Introduction, failure rates, Hazard function, estimation of reliability, exponential distribution as life model, its memory less property

Text Books:
1. B.A / B.Sc III year paper – IV Statistics – applied statistics – Telugu Academy by Prof. K Srinivasa Rao, Dr D Giri, Dr A Anand, Dr V Papaiah Sastry

2. Fundamental of Applied Statistics : V.K.Kapoor and S.C.Gupta:

3. S K Sinha : Reliability and life testing . Wiley Eastern

Reference books:
1. R C Gupta : Statistical Quality Control
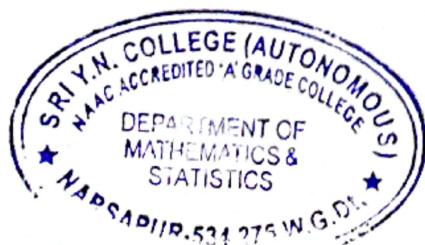
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Practicals

1. Construction of $\bar{X}$, R – Charts
2. Construction of P – Charts
3. Construction of P – Chart – Variable Sample Size
4. Construction of np – Chart
5. Construction of C – Chart
6. Ms – Excel methods for the serial numbers 1.
7. Ms – Excel methods for the serial numbers 2 to 4 (any one)

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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 questions

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

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

Each question carries 10 marks.

Note : Under Section –A (Q. No: 13) and Section – B (Q. No: 14) will be given from UNIT-III
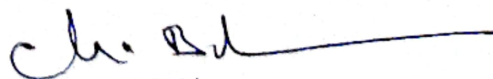
SECTION-A

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 – Paper VI

MATHEMATICAL EXPECTATION AND PROBABILITY DISTRIBUTIONS

Model Question Paper (Theory) (for 2019-22 batch w. e. f 2019-2020)

Time: 3Hrs   Max Marks: 75

PART-I

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

1. Explain the Process Control and Product Control.
2. Explain Standard Deviation Chart.
3. Explain need for Sampling Inspection Plan.
4. Explain Single Sampling Plan.
5. Explain Hazard Function.
6. Explain the Concept of Six – Sigma.
7. Explain Reliability Function.
8. What are the types of Control Charts.

PART-II

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

SECTION – A

9. Discuss the importance of Statistical Quality Control in industry.
10. Explain Construction of Mean & Range Charts.
11. What are the charts for attributes. Explain np, p – charts?
12. Explain the Double Sampling Plan.
13. Define and explain AQL & LTPD.

SECTION-B

14. Explain (i) Producer's Risk (ii) Consumer's Risk
15. Explain the memory less property of Exponential Distribution.
16. Explain Reliability function and give its estimation.
17. Write the O.C and A.S.N. function for Single Sampling Plan.
18. Explain Natural tolerance limits and Specification limits.
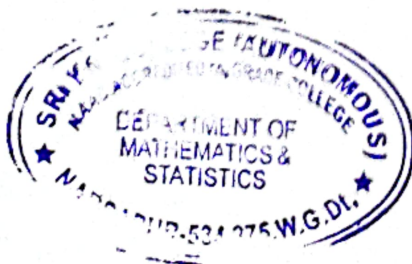
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Paper VII, Syllabus for VI semester

Optimization Techniques

Unit-I (10 Marks-2,5 Marks-2)

Operations Research: Origin and development of OR., Nature and features of O.R., Scientific method and Modeling in O.R., Advantages and limitations of models, General solution methods for O.R. models.

Unit-II (10 Marks-2,5 Marks-1)

Linear Programming Problem : Definition, components, basic assumptions, Mathematical formulation of the problem, Illustrations on mathematical formulation of LPP, LPP – Graphical solution method, some exceptional cases in graphical method – alternative optima , unbounded solution and infeasible solutions.

Unit-III (10 Marks-2,5 Marks-1)

Linear Programming Problem – Simplex Method - I –General LPP – Objective function, constraints, non negative restrictions, Solution of LPP, feasible solution and optimum solution, Canonical and standard forms of LPP., Basic solution – definition, degenerate solution, basic feasible solution, associated cost vector, improved basic feasible solution, optimum basic feasible solution and net evaluation, Fundamental theorem of LPP., the computational procedure – Simplex algorithm, Simple linear programming problems.

Unit-IV (10 Marks-2,5 Marks-2)

Linear Programming Problem Simplex method – II: Artificial variable technique, The Big M method or method of Penalties, Degeneracy, Alternative optima, Unbounded solutions, Non existing or infeasible solutions

Unit-V(10 Marks-2,5 Marks-2)

Duality in Linear Programming: General Primal – Dual pair, Formulation a dual problem, Primal – Dual pair in Matrix form, Duality.

Reference books:
1. Operations Research, Kanthi Swaroop.
2. Operations Research Theory, Methods and Applications, SD Sharma.
3. Krishna's Operations Research, Dr RK Gupta.
4. Operations research : Theory and Applications, JK Sharma.
5. Operations Research : An Introduction, Hamdy A Taha.

Practicals
1. Formulation of LPP
2. Formulation of LPP by Graphical Method (Maximization)
3. Formulation of LPP by Graphical Method (Minimization)
4. Solutions of LPP by Simplex method
5. Solutions of LPP by Big – M method
6. Solutions of LPP by using principal of duality
7. MS Excel is compulsory for serial number 2,4,6

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SEMESTER-VI
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	: 1 question
Unit - IV	: 2 questions
Unit - V	: 2 questions

PART-II(5 x 10 M= 50 M)   rks:75
Answer any FIVE questions. Choosing atleast TWO questions from each section.

Each question carries 10 marks.

Note : Under Section –A (Q. No: 13) and Section – B (Q. No: 14) will be given from UNIT-III

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 – Paper VII

OPTIMIZATION TECHNIQUES

Model Question Paper (Theory) (for 2019-22 batch w. e. f 2019-2020)

Time: 3Hrs   Max Marks: 75

PART-I

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

1. Define OR and explain the features of OR.
2. Explain the different models in OR.
3. Explain the Mathematical formulation of LPP.
4. Explain an Optimum basic feasible solution.
5. Explain degeneracy in LPP
6. Explain an unbiased solution.
7. Explain the concept of duality.
8. Explain an economic interpretation of duality problem.

PART-II

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

SECTION – A

9. Define OR and discuss the significance and scope of OR.
10. Explain the advantages and limitations of OR.
11. 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.
12. Explain the Graphical method of LPP.
13. State and prove Fundamental Theorem of LPP.

SECTION-B

14. Use Simplex method to solve the following LPP

$$\text{Max } Z = 7x_1 + 5x_2$$

Subject to the constraints

$$x_1 + 2x_2 \le 6$$
$$4x_1 + 3x_2 \le 12$$
$$\text{and } x_1, x_2 \ge 0$$

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

$$\text{Min } Z = 2x_1 + x_2$$

Subject to the constraints

$$3x_1 + x_2 = 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$

and $x_1 , x_2 \geq 0$

16. Explain Artificial variable technique or Big – M method.

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

18. Show that Dual of dual of the primal is primal.