KRISHNA UNIVERSITY

RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21

Semester – II (CBCS With Mathematics Combination Common to BA/BSc)

Paper - II: **Probability Theory and Distributions**

UNIT-I

Introduction to Probability: 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: 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 : 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: 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: 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 Mathematical Statistics, Sultan Chand & Sons, New Delhi.
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.

Dr.N.Srinivasa Rao
Chairperson BoS KRU
Head Dept of Statistics
Andhra Loyola College (Autonomous)
Vijayawada -520008

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 Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , NewDelhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

Credits 2

Practicals Paper – II

1. Fitting of Binomial distribution – Direct method.
2. Fitting of binomial distribution – Recurrence relation Method.
3. Fitting of Poisson distribution – Direct method.
4. Fitting of Poisson distribution - Recurrence relation Method.
5. Fitting of Negative Binomial distribution.
6. Fitting of Geometric distribution.
7. Fitting of Normal distribution – Areas method.
8. Fitting of Normal distribution – Ordinates method.
9. Fitting of Exponential distribution.

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.

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,
5) Acumen to apply standard discrete and continuous probability distributions to different situations.

Dr N. Srinivasa Rao
Chairperson BoS KRU
Head Dept of Statistics
Andhra Loyola College (Autonomous)
Vijayawada - 520008

KRISHNA UNIVERSITY

BA/B Sc - I YEAR: STATISTICS: II SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- II

PAPER-2: Probability Theory and Distributions

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
2. Define Conditional Probability
3. Define Random Variable.
4. Define Distribution Function of one-dimensional random variable
5. Define Expectation of Function of a Random variable.
6. Define Moment Generating Function
7. Characteristic Function of Poisson Distribution
8. Area property of Normal Distribution.

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** State and Prove Boole's Inequality.

(OR)

b) State and Prove Multiplication theorem on Probability for 'n' Events.

10. **a)** Explain Distribution function of the bi-variate random variable and its properties.

(OR)

b) Find Mean and Variance of a random variable 'X' whose probability density function is given by $f(x) = k\,x(2-x)$,$0 \le x \le 2$ where k is constant.

11. **a)** State and Prove Cauchy – Schwartz Inequality

(OR)

b) State and Prove Chebychev's Inequality

12. **a)** Prove Recurrence relation for the moments of Binomial Distribution

(OR)

b) Find Mean and Variance of Geometric Distribution.

13. **a)** Define Rectangular Distribution also find its Mean and Variance.

(OR)

b) Explain important features of Normal Distribution

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B.A/B.Sc., STATISTICS CBCS REVISED SYLLABUS 2020-21
Semester – IV (CBCS With Mathematics Combination Common to BA/BSc)

Paper IV: Sampling Techniques and Designs of Experiments

UNIT I

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

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

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

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

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

Reference Books:

1. Fundamentals of applied statistics : VK Kapoor and SC Gupta.
2. Indian Official statistics - MR Saluja.
3. Anuvarthita Sankyaka Sastram - Telugu Academy.

Credits: 2

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 and SRSWOR.

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 of CRD.
7. Analysis of RBD Comparison of relative efficiency of CRD with RBD
8. Estimation of single missing observation in RBD and its analysis
9. Analysis of LSD and efficiency of LSD over CRD and RBD
10. Estimation of single missing observation in LSD and its analysis
11. Analysis of 2^2 with RBD layout
12. Analysis of 2^3 with RBD layout

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

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.

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BA/B Sc - II YEAR: STATISTICS: IV SEMESTER (CBCS)

(With Mathematics Combination)

SEMESTER- IV

PAPER-4: Sampling Techniques and Design of Experiments

TIME: 3 Hours **MODEL QUESTION PAPER** **Max Marks: 75**

Section – A

Answer any 5 Questions (5 x 5 = 25)

1. Define Simple Random Sampling
2. Merits and limitation of Simple random Sampling
3. Advantages of Stratified random sampling.
4. Define Systematic Sampling.
5. State Cochran's theorem
6. Gauss- Markoff Linear model
7. Missing plot technique in RBD
8. life advantages of factorial experiments

Section – B

Answer ALL Questions, Each Question Carries 10 Marks (5 x 10 =50)

9. **a)** Prove that in srswor the variance of the sample mean is $V(\bar{y}_n) = \frac{S^2}{n}\ \frac{N-n}{N}$

(OR)

b) Explain Simple random sampling without replacement (SRSWOR) and Simple random sampling with replacement (SRSWR). In SRSWOR sample mean square is an unbiased estimator of the population mean square

10. **a)** In Neyman allocation show that $n_i \propto N_i S_i$

(OR)

b) With usual notations, prove that $V(\bar{y}_{st})opt \leq V(\bar{y}_{st})prop \leq V(\bar{y}_n)R$

11. **a)** Explain **ANOVA** I way classifications

(OR)

b) Explain Principles of Experimental Designs

12. **a)** Explain Randomised Block Design

(OR)

b) Explain Latin Square Design.

13. **a)** Explain main effects and interactions of 2^2 factorial design

(OR)

b) Write the statistical analysis of 2^3 factorial experiments design

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