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| C:\Users\dell\Desktop\P.R LOGO.png | **P.R.GOVERNMENT COLLEGE(A), KAKINADA** | **Program &Semester****II B.Sc Major****(III Sem)** **(2023-24)** |
| Course Code |  **TITLE OF THE COURSE****THEORETICALDISCRETEDISTRIBUTIONS** |
| Teaching | Hours Allocated: 60 (**Theory**) | L | T | P | C |
| Pre-requisites: | **Basic Knowledge in Theoretical discrete distributions.** | 4 | - | - | 4 |

# Course Objectives:

* 1. TodealwiththedatabythebasicdiscretedistributionssuchasUniformandBinomial distributions.
	2. ToacquaintthePoissondistribution applications.
	3. TolearnabouttheNegativeBinomialdistributionanditsapplicationstowardsthereallifeproblems.

4.To familiarwithdealingthedata byGeometricandHyperGeometricdistributions.

# Course Outcomes:

|  |
| --- |
| On Completion of the course, the students will be able to- |
| **CO1** | **learn about basic concepts of basicDiscrete diatributions.** |
| **CO2** | **learn about basic concepts of poisson distribution.** |
| **CO3** | **learn about various measures of negative binomial distribution.** |
| **CO4** | **know about various measures of Geometric distribution.** |
| **CO5** | **know about Concept of Hyper geometric distribution.** |

**Course with focus on employability / entrepreneurship / Skill Development modules**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Skill Development |  |  | Employability |  |  | Entrepreneurship |  |

**Unit–1:Uniform,BernoulliandBinomialdistributions**

Discrete Uniform distribution – definitions, mean, variance.Bernoulli distribution – definitions, mean, variance and its mgf.Binomial distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive propertyifexists, skewness, kurtosis and problems. First two moments obtainedthrough mgf, recurrence relation for probabilities, limiting case of Binomial Distribution to Normal distribution.

Unit–2:PoissonDistribution

Poisson distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Poisson distribution as a limiting case of Binomial distribution, limiting case of Poisson Distribution to Normal distribution.

Unit–3:NegativeBinomialDistribution

Negative Binomial Distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relationfor probabilities. Limiting case of Negative Binomial Distribution to Normal distribution.

Unit–4:GeometricDistribution

Geometric Distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, Lack of memory property. Recurrence relation for probabilities.

Unit–5:HyperGeometricDistribution

Hyper Geometric Distribution – Definition, mean and variance, problems.Recurrence relation for probabilities. Limiting case of Hyper Geometric distribution to Binomial distribution

# Textbooks:

1. S. C. Gupta & V. K. Kapoor:Fundamentals of MathematicalStatistics, Sultan Chand&Sons, New Delhi.
2. O.P.Gupta:MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi &EhsanesSaleh:AnIntroductiontoProbabilityandStatistics,JohnWiley&Sons.

# Reference books:

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2. **O.P.Gupta: MathematicalStatistics,KedarnathRamnath&Co.**
3. **P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.**
4. **K.Rohatgi&EhsanesSaleh: AnIntroductionto Probabilityand Statistics, JohnWiley&Sons.**

# WebLinks:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

 3. <https://www.scribbr.com/statistics/descriptive-statistics/>

# CO-PO Mapping:

**(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High} '-':No Correlation)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
| CO1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| C:\Users\dell\Desktop\P.R LOGO.png |  **P.R.GOVERNMENT COLLEGE(A), KAKINADA** |  **Program & Semester****II B.Sc Major****(III Sem)** **(2023-24)** |
| **CourseCode** |  **TITLE OF THE COURSE****THEORETICALDISCRETEDISTRIBUTIONS** |
| **Practical** | Hours Allocated: 30 | **L** | **T** | **P** | **C** |
| **Pre-requisites:** | **Basic Knowledge in Theoretical discrete distributions.** | **-** | **-** | **2** | **1** |

* 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–Direct method.
	6. Fitting of Negative Binomial distribution–Recurrence relation Method.
	7. Fitting of Geometric distribution –Direct method.
	8. Fitting of Geometric distribution–Recurrence relation Method.
	9. Fitting of Hyper Geometric distribution.

# Virtual Lab Links:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

 3. <https://www.scribbr.com/statistics/descriptive-statistics/>

 4. <https://byjus.com/maths/probability-and-statistics/>

5. <https://oli.cmu.edu/courses/probability-statistics-open-free/>

**SEMESTER-III: THEORETICALDISCRETEDISTRIBUTIONS (MAJOR)**

 **Model blue print for the Question Paper setter**

 **Max. Marks: 50 Time: 2 Hrs.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **I** | **2** | **2** | **30** |
| **II** | **2** | **1** | **20** |
| **III** | **1** | **1** | **15** |
| **IV** | **1** | **1** | **15** |
| **V** | **1** | **1** | **15** |
| **Total including choice**  | **7** | **6** | **95** |

**Pithapur Rajah’s Government College (Autonomous), Kakinada**

**II year B.Sc., Degree Examinations – III Semester (w.e.f 2023-24)**

**For 2023-24 batch**

**Statistics Course V: THEORETICALDISCRETEDISTRIBUTIONS (MAJOR 01)**

**Model Paper**

**Time: 2 Hrs. Max. Marks: 50**

**Answer any THREE of the following. Choosing at least one from each part. 3x10=30M**

 **SECTION - A**

**PART- I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | Explain about Limiting case of Binomial distribution to Normal distribution? | BT1 | PO2 | C01 |
| 2 | Define Binomial distribution and derive its Mean and Variance through M.G.F? | BT3 | PO3 | C01 |
| **3** | Explain Limiting case of Poisson distribution to Binomial distribution. | BT3 | PO4 | CO3 |

**PART- II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Illustrate about Limiting case of Negative Binomial Distribution to Normal distribution. | BT3 | PO3 | CO3 |
| 5 | Define Geometric distribution and derive its Mean and Variance through M.G.F. | BT1 | PO1 | CO2 |
| **6** | Define Hyper-Geometric distribution and derive its Mean and Variance through M.G.F. | BT2 | PO2 | CO3 |

**SECTION – B**

**Answer any FOUR of the following: 4x5=20M**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7. | Define Bernoulli distribution? | BT1 | PO2 | C01 |
| 8 | Explain about Binomial distribution? | BT2 | PO2 | C04 |
| 9 | Define Poisson distribution? | BT3 | PO5 | CO2 |
| 10 | Describe C.F of Poisson distribution? | BT2 | P02 | C02 |
| 11 | Discuss about C.F of Negative Binomial Distribution? | BT1 | PO1 | CO2 |
| 12 | Define Geometric distribution? | BT3 | PO4 | CO3 |
| 13 | Describe C.F of Hyper-Geometric distribution? | BT1 | PO3 | CO5 |

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| C:\Users\dell\Desktop\P.R LOGO.png | **P.R.GOVERNMENT COLLEGE(A), KAKINADA** |  **Program & Semester****II B.Sc Major****(III Sem)** **(2023-24)** |
| Course Code |  **TITLE OF THE COURSE****THEORETICAL CONTINUOUSDISTRIBUTIONS** |
| Teaching | Hours Allocated: 60 (**Theory**) | L | T | P | C |
| Pre-requisites: | **Basic Knowledge in Theoretical continuous distributions.** | 4 | - | - | 4 |

# Course Objectives:

1. TodealwiththedatabythebasiccontinuousdistributionssuchasUniformandExponential distributions.
2. Toacquaintthegamma and betadistribution applications.
3. TolearnabouttheNormal distributionanditsapplicationstowardsthereallifeproblems.

4.To familiarwithdealingthedata bystandard normal distributions.

# Course Outcomes:

|  |
| --- |
| On Completion of the course, the students will be able to- |
| **CO1** | **learn about basic concepts of uniform distribution** |
| **CO2** | **learn about basic concepts of exponential distribution** |
| **CO3** | **learn about various measures of gamma and beta distribution** |
| **CO4** | **know about various importance of Normal distribution** |
| **CO5** | **know about standard normal distribution.** |

**Course with focus on employability / entrepreneurship / Skill Development modules**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Skill Development |  |  | Employability |  |  | Entrepreneurship |  |

**Unit–1:Continuous Uniform distribution**Definition,moments,M.G.F,C.F,C.G.F,skewness,kurtosisandDistribution function. Mean Deviation about mean.

Unit– 2: Exponential distribution – Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and Distribution function. Memory less property.

Unit–3:Gamma and Beta Distributions: Gamma Distribution-Definition, moments, M.G.F, C.F, C.G.F, skewness , kurtosis and additive property. Limiting form of gamma distribution.

Beta Distribution of first and second kind–Definition, mean, variance and harmonic mean.

Unit–4:Normal Distribution – Definition, properties, importance, M.G.F, C.F, C.G.F, additive property, skewness, kurtosis and problems. Obtain mean, median and mode, Even and Odd order moments about mean, linear combination of normal variates, points of inflexion of normal probability curve

**Unit–5:**Standard Normal and Sampling Distributions

Standard Normal Distribution–Definition, mgf, mean and variance, Area property, problems. Student’s t- distribution, F – Distribution, χ2- Distribution: Definitions, properties and their application

# Textbooks:

1. S. C. Gupta & V. K. Kapoor:Fundamentals of MathematicalStatistics, Sultan Chand&Sons, New Delhi.
2. O.P.Gupta:MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi &EhsanesSaleh:AnIntroductiontoProbabilityandStatistics,JohnWiley&Sons.

# Reference books:

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# CO-PO Mapping:

**(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High} '-':No Correlation)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
| CO1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| C:\Users\dell\Desktop\P.R LOGO.png | **P.R.GOVERNMENT COLLEGE(A), KAKINADA** |  **Program & Semester****II B.Sc Major****(III Sem)** **(2023-24)** |
| **CourseCode** | **THEORETICAL CONTINUOUSDISTRIBUTIONS** |
| **Practical** | Hours Allocated: 30 | **L** | **T** | **P** | **C** |
| **Pre-requisites:** | **Basic Knowledge in Theoretical continuous distributions.** | **-** | **-** | **2** | **1** |

* 1. Calculation of moments of Uniform distribution.
	2. Calculation of skewness and kurtosis of Uniform distribution.
	3. FittingofExponentialdistribution.
	4. Gammadistributionapplicationorientedproblems.
	5. FittingofNormaldistribution–Areasmethod.
	6. FittingofNormaldistribution –Ordinatesmethod.
	7. ProblemsrelatedtoStandardNormal distribution.

# Virtual Lab Links:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

 3. <https://www.scribbr.com/statistics/descriptive-statistics/>

 4. <https://byjus.com/maths/probability-and-statistics/>

 5.<https://oli.cmu.edu/courses/probability-statistics-open-free/>

**SEMESTER-III : THEORETICAL CONTINUOUS DISTRIBUTIONS**

**Model blue print for the Question Paper setter**

**Max. Marks: 50 Time: 2 Hrs.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **I** | **1** | **1** | **15** |
| **II** | **2** | **1** | **20** |
| **III** | **1** | **2** | **25** |
| **IV** | **2** | **1** | **20** |
| **V** | **1** | **1** | **15** |
| **Total including choice**  | **7** | **6** | **95** |

**Pithapur Rajah’s Government College (Autonomous), Kakinada**

**II year B.Sc., Degree Examinations – III Semester (w.e.f 2023-24)**

**For 2023-24 batch**

**Statistics Course 6: THEORETICAL CONTINUOUSDISTRIBUTIONS(MAJOR 02)**

**Model Paper**

**Time: 2 Hrs. Max. Marks: 50**

**Answer any THREE of the following. Choosing at least one from each part. 3x10=30M**

 **SECTION - A**

**PART- I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | Define Uniform distribution and derive it’s mean and variance. | BT3 | PO1 | CO5 |
| 2 | State and prove Memory less property of Exponential distribution. | BT2 | P02 | C02 |
| **3** | Define Gamma distribution and derive it’s mean and variance through M.G.F. | BT1 | PO3 | CO5 |

**PART- II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Describe briefly about the Beta distribution of second kind and derive it’s mean and variance. | BT3 | PO4 | CO3 |
| 5 | Define Normal distribution and derive it’s mean and variance. | BT2 | PO2 | CO3 |
| **6** | Define chi-square distribution and explain it’s properties. | BT3 | PO5 | CO2 |

**SECTION – B**

**Answer any FOUR of the following: 4x5=20M**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7. | Write about the C.F of Uniform distribution. | BT3 | PO3 | C01 |
| 8 | Define Exponential distribution. | BT3 | PO1 | CO5 |
| 9 | Describe C.F of Exponential distribution. | BT3 | PO2 | CO5 |
| 10 | Discuss about the Harmonic mean. | BT2 | PO2 | CO3 |
| 11 | Write about Area property of Normal distribution. | BT3 | PO5 | CO2 |
| 12 | Explain about Sampling distribution. | BT3 | PO3 | CO3 |
| 13 | Define Normal distribution. | BT2 | PO3 | CO3 |

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| C:\Users\dell\Desktop\P.R LOGO.png | **P.R.GOVERNMENT COLLEGE(A), KAKINADA** |  **Program & Semester****II B.Sc Major/Minor****(III Sem)** **(2023-24)** |
| Course Code |  **TITLE OF THE COURSE****STATISTICAL METHODS** |
| Teaching | Hours Allocated: 60 (**Theory**) | L | T | P | C |
| Pre-requisites: | **Basic Knowledge in Statistical methods.** | 4 | - | - | 4 |

# Course Objectives:

1. TodealwiththedatabythebasicdiscretedistributionssuchasUniformandBinomial distributions.
2. ToacquaintthePoissondistribution applications.
3. TolearnabouttheNegativeBinomialdistributionanditsapplicationstowardsthereallifeproblems.

4.To familiarwithdealingthedata byGeometricandHyperGeometricdistributions.

# Course Outcomes:

|  |
| --- |
| On Completion of the course, the students will be able to- |
| **CO1** | **learn about basic concepts of curve fitting** |
| **CO2** | **learn about basic concepts of correlation data** |
| **CO3** | **learn about various measures of Correlation** |
| **CO4** | **know about various measures of Regression** |
| **CO5** | **know about Probability Concept and attributes** |

**Course with focus on employability / entrepreneurship / Skill Development modules**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Skill Development |  |  | Employability |  |  | Entrepreneurship |  |

**Unit– 1:Curve fitting**

Bivariate data, Principle of least squares, fitting of kth degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, fitting of familyof exponential curves and power curve.

Unit– 2:Correlation

Meaning,TypesofCorrelation,MeasuresofCorrelation –Scatter diagram,KarlPearson’sCoefficient of Correlation, Rank Correlation Coefficient (with and without ties), Properties. Bi-variate frequency distribution, correlation coefficient for bivariate data and problems. Lag and Lead in correlation.

Unit–3:

Coefficient of concurrent deviation, probable error and its properties, coefficient of determination, Concept of multiple and partial correlation coefficients (three variables only), properties and problems, intra-class correlation and correlation ratio.

Unit– 4:Regression

Concept of Regression, Linear and Non Linear regression.Linear Regression – Regression lines, Regression coefficients andit properties, Angle between two lines of regression. Regressions lines for bivariate data and simple problems. Correlation vs regression.Explained and Unexplained variations.

Unit– 5:Attributes

Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistencyof 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.

# Textbooks:

1. S. C. Gupta & V. K. Kapoor:Fundamentals of MathematicalStatistics, Sultan Chand&Sons, New Delhi.
2. O.P.Gupta:MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.

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3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi&EhsanesSaleh: AnIntroductionto Probabilityand Statistics, JohnWiley&Sons.

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# CO-PO Mapping:

**(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High} '-':No Correlation)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
| CO1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| Course Code |  **TITLE OF THE COURSE****STATISTICAL METHODS** |
| Teaching | Hours Allocated: 60 (**Theory**) | L | T | P | C |
| Pre-requisites: | **Basic Knowledge in Statistical methods.** | 4 | - | - | 4 |

* 1. Fittingofstraightlinebythemethodofleastsquares
	2. Fittingofparabolabythemethodofleastsquares
	3. Fittingofexponentialcurveoftwotypes bythe methodofleastsquares.
	4. Fittingofpower curveofthetypebythemethodof leastsquares.
	5. Computationofcorrelation coefficientandregressionlinesforungroupeddata.
	6. Computationofcorrelationcoefficientforbivariatefrequencydistribution.
	7. Computationofcorrelationcoefficient,formingregressionlinesforgroupeddata.
	8. Computationofpartialandmultiplecorrelationcoefficients.
	9. ComputationofYule'scoefficientofassociation andcolligation.
	10. ComputationofPearson's,Tschuprow’scoefficientofcontingency.

# Virtual Lab Links:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

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 4. <https://byjus.com/maths/probability-and-statistics/>

 5. <https://oli.cmu.edu/courses/probability-statistics-open-free/>

**SEMESTER-III: STATISTICAL METHODS (MAJOR 3/MINOR)**

 **Model blue print for the Question Paper setter**

 **Max. Marks: 50 Time: 2 Hrs.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **I** | **1** | **1** | **15** |
| **II** | **2** | **1** | **20** |
| **III** | **1** | **1** | **15** |
| **IV** | **1** | **2** | **25** |
| **V** | **2** | **1** | **20** |
| **Total including choice**  | **7** | **6** | **95** |

**Pithapur Rajah’s Government College (Autonomous), Kakinada**

**II year B.Sc., Degree Examinations – III Semester (w.e.f 2023-24)**

**For 2023-24 batch**

**Statistics Course 7:STATISTICAL METHODS (MAJOR 3/MINOR)**

**Model Paper**

**Time: 2 Hrs. Max. Marks: 50**

**Answer any THREE of the following. Choosing at least one from each part. 3x10=30M**

 **SECTION - A**

**PART- I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | Explain about Fitting of second-degree parabola. | BT3 | PO3 | C01 |
| 2 | Derive Spearman’s Rank correlation coefficient. | BT3 | PO4 | CO3 |
| **3** | Explain about Multiple and Partial correlation coefficient. | BT3 | PO3 | CO3 |

**PART- II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Distinguish between Correlation vs Regression. | BT3 | PO4 | CO3 |
| 5 | Prove that angle between two lines of regression. | BT1 | PO3 | CO5 |
| **6** | Describe about the relationship between Association and Colligation of Attributes. | BT3 | PO5 | CO2 |

**SECTION – B**

**Answer any FOUR of the following: 4x5=20M**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7. | Explain about principal of Least Squares. | BT3 | PO3 | C01 |
| 8 | Define Correlation and types of correlation. | BT2 | P02 | C02 |
| 9 | Explain about Karl Pearson's Coefficient of Correlation. | BT1 | PO1 | CO2 |
| 10 | Describe about Intra-class correlation. | BT1 | PO3 | CO5 |
| 11 | Define Regression. | BT1 | PO2 | CO3 |
| 12 | Describe about Consistency of data. | BT1 | PO3 | CO5 |
| 13 | Define Association of attributes  | BT3 | PO1 | CO5 |

|  |  |  |
| --- | --- | --- |
| C:\Users\dell\Desktop\P.R LOGO.png | **P.R.GOVERNMENT COLLEGE(A), KAKINADA** |  **Program & Semester****II B.Sc Major****(III Sem)** **(2023-24)** |
| Course Code |  **TITLE OF THE COURSE** **INFERENTIAL STATISTICS** |
| Teaching | Hours Allocated: 60 (**Theory**) | L | T | P | C |
| Pre-requisites: | **Basic Knowledge in Statistical methods.** | 4 | - | - | 4 |

# Course Objectives:

1. Todealwiththedatabythebasicestimation suchasmeasures of estimation.
2. Toacquaintthetesting of hypothesis applications.
3. TolearnabouttheLarge sample test anditsapplicationstowardsthereallifeproblems.

4.To familiarwithdealingthedata byNon parametric tests.

# Course Outcomes:

|  |
| --- |
| On Completion of the course, the students will be able to- |
| **CO1** | **learn about basic concepts of estimation** |
| **CO2** | **learn about basic concepts of definitions of hypothesis** |
| **CO3** | **learn about various large sample tests** |
| **CO4** | **know about various small sample tests** |
| **CO5** | **know about parametric and non parametric tests** |

**Course with focus on employability / entrepreneurship / Skill Development modules**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Skill Deveopment |  |  | Employability |  |  | Entrepreneurship |  |

**Unit– 1:Theory ofestimation**Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE’s. Rao – Cramer Inequality, properties. Binomial, Poisson & Normal Population parameters estimate by MLE method. Confidence Intervals.

**Unit– 2:**Testing ofHypothesis

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–3:** Large sampleTests

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(s) and correlation coefficient(s**).**

**Unit–4:**SmallSampletests

Assumptions and t-test for single mean, difference of means and paired t-test. 𝜒2test for goodnessof fit and independence of attributes. 𝜒2test for single variance,F-test for equality ofvariances.

**Unit–5:**Non-parametrictests

Advantages and disadvantages, comparison with parametric tests. 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.

# Textbooks:

1. S. C. Gupta & V. K. Kapoor:Fundamentals of MathematicalStatistics, Sultan Chand&Sons, New Delhi.
2. O.P.Gupta:MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi &EhsanesSaleh:AnIntroductiontoProbabilityandStatistics,JohnWiley&Sons.

# Reference books:

1. S.C. Gupta&V.K. Kapoor:FundamentalsofMathematicalStatistics,Sultan Chand& Sons,NewDelhi.
2. O.P.Gupta: MathematicalStatistics,KedarnathRamnath&Co.
3. P.N.Arora&S.Arora:QuantitativeAptitudeStatistics–VolII,S.Chand&CompanyLtd.
4. K.Rohatgi&EhsanesSaleh: AnIntroductionto Probabilityand Statistics, JohnWiley&Sons.

# WebLinks:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

 3. <https://www.scribbr.com/statistics/descriptive-statistics/>

# CO-PO Mapping:

**(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High} '-':No Correlation)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
| CO1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| Pre-requisites: | **Basic Knowledge in Statistical methods.** | 4 | - | - | 4 |

1. Largesampletestforsinglemean
2. Largesampletestfordifferenceofmeans
3. Largesampletestforsingleproportion
4. Largesampletestfordifferenceofproportions
5. Largesampletestfordifferenceofstandarddeviations
6. Largesampletest forcorrelation coefficient
7. Smallsampletestforsingle mean
8. Smallsampletestfordifferenceof means
9. Smallsampletestforcorrelationcoefficient
10. Pairedt-test(paired samples).
11. Small sampletestforsinglevariance(𝜒2test)
12. Smallsampletestfordifferenceofvariances(F-test)
13. 𝜒2testfor goodnessoffitandindependence ofattributes
14. Nonparametrictestsforsinglesample(runtest,signtestandWilcoxonsignedranktest)
15. Nonparametrictestsforrelatedsamples(signtestandWilcoxonsignedranktest)
16. Nonparametrictestsfortwoindependentsamples(Mediantest,Wilcoxon –Mann-Whitney-Utest, Wald - Wolfowitz' s runs test)

# Virtual Lab Links:

 1. <https://conjointly.com/kb/descriptive-statistics/>

 2. <https://en.wikipedia.org/wiki/Descriptive_statistics>

 3. <https://www.scribbr.com/statistics/descriptive-statistics/>

 4. <https://byjus.com/maths/probability-and-statistics/>

 5. <https://oli.cmu.edu/courses/probability-statistics-open-free/>

**SEMESTER-III: INFERENTIAL STATISTICS (MAJOR)**

 **Model blue print for the Question Paper setter**

 **Max. Marks: 50 Time: 2 Hrs.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Short Answer Questions** | **Essay Questions** | **Marks allotted to the Unit/Chapter** |
| **I** | **1** | **2** | **25** |
| **II** | **2** | **1** | **20** |
|  **III** | **1** | **1** | **15** |
| **IV** | **2** | **1** | **20** |
| **V** | **1** | **1** | **15** |
| **Total including choice**  | **7** | **6** | **95** |

**Pithapur Rajah’s Government College (Autonomous), Kakinada**

**II year B.Sc., Degree Examinations – III Semester (w.e.f 2023-24)**

**For 2023-24 batch**

**Statistics Course 8: INFERENTIAL STATISTICS (MAJOR 4)**

**Model Paper**

**Time: 2 Hrs. Max. Marks: 50**

**Answer any THREE of the following. Choosing at least one from each part. 3x10=30M**

 **SECTION - A**

**PART- I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | Describe about the criteria of a good estimator. | BT1 | PO2 | C01 |
| 2 | Define MLE’s and explain about properties of MLE’s. | BT3 | PO3 | C01 |
| **3** | State and prove Neyman's Pearson's Lemma. | BT3 | PO2 | CO5 |

**PART- II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Explain about test for differences of Proportions. | BT3 | PO4 | CO3 |
| 5 | Illustrate about chi-square test for goodness of fit. | BT2 | PO2 | CO3 |
| **6** | Distinguish between the parametric tests and non-parametric tests? | BT4 | PO5 | CO4 |

 **SECTION – B**

**Answer any FOUR of the following: 4x5=20M**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7. | State Neyman's factorization theorem. | BT3 | PO3 | CO3 |
| 8 | Define Null and Alternative hypothesis. | BT2 | P02 | C02 |
| 9 | Explain about level of significance. | BT1 | PO3 | CO5 |
| 10 | Explain about large sample test for correlation coefficients. | BT2 | PO1 | C04 |
| 11 | Describe about chi-square - test for single variance. | BT2 | PO2 | C04 |
| 12 | Describe about paired t-test. | BT2 | PO2 | CO3 |
| 13 | Write about Advantages and Disadvantages of Non-parametric tests | BT2 | PO3 | CO3 |