SRI VENKATESWARA UNIVERSITY – TIRUPATI
B.S.c., (Honours) in STATISTICS (Major)
SEMESTER-III
(W.E.F. Academic Year 2024 - 25)
COURSE 5: THEORETICAL DISCRETE DISTRIBUTIONS

Theory Credits: 3 3 hrs/week

I. Learning Outcomes :

After successful completion of the course students will be able to:
1. To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
2. To acquaint the Poisson distribution applications.
3. To learn about the Negative Binomial distribution and its applications towards the real life problems.
4. To familiar with dealing the data by Geometric and Hyper Geometric distributions.

II. Syllabus :

Unit – 1: Binomial distributions
Binomial distribution – Definition - Mean and variance - M.G.F - C.F - P.G.F- Additive property if exists - Skewness, Kurtosis and problems. First two moments obtained through mgf - Recurrence relation for probabilities.

Unit – 2: Poisson Distribution
Poisson distribution - Definition - Mean and variance - M.G.F - C.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,

Unit – 3: Negative Binomial Distribution
Negative Binomial Distribution - Definition - Mean and variance - M.G.F - C.F - P.G.F- Additive property if exists - Skewness, Kurtosis and problems. First two moments obtained through mgf - Recurrence relation for probabilities - Limiting case of Negative Binomial Distribution to Poisson distribution.

Unit – 4: Geometric Distribution
Geometric Distribution – D Definition - Mean and variance - M.G.F - C.F - P.G.F- Additive property if exists - Skewness, Kurtosis and problems. First two moments obtained through mgf - Recurrence relation for probabilities - Lack of memory property.

Unit – 5: Hyper Geometric Distribution
Hyper Geometric Distribution – Definition, mean and variance, Recurrence relation for probabilities. Limiting case of Hyper Geometric distribution to Binomial distribution.

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COURSE 5: THEORETICAL DISCRETE DISTRIBUTIONS

Practical Credits: 1 2 hrs/week

III. Syllabus

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 – Recurrence relation Method.
6. Fitting of Geometric distribution – Recurrence relation Method.
7. Fitting of Hyper Geometric 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.

IV. Text Books/References

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath& Co.
3. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi &Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

V. Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
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SEMESTER-III
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MODEL PAPER

COURSE 5: THEORETICAL DISCRETE DISTRIBUTIONS

Time: 3hrs **Max.Marks : 70**

Section – A

Answer any Five of the following questions. **5X4=20M**

1.

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Section – B

Answer All Questions. Each Question carries 10 Marks. **5X10=50M**

9. a)

Or

b)

10. a)

Or

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11. a)

Or

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12. a)

Or

b)

13. a)

Or

b)

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(W.E.F. Academic Year 2024 - 25)
COURSE 6: THEORETICAL CONTINUOUS DISTRIBUTIONS

Theory Credits: 3 3 hrs/week

I. Learning Outcomes

After successful completion of the course students will be able to:
1. To deal with the data by the basic continuous distribution such as Uniform Binomial distribution.
2. To acquaint the Exponential distribution applications.
3.To learn about the Gamma and Beta distributions and their applications towards the real life problems.
4. To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
5. To acquire the knowledge of exact sampling distributions.

II. Syllabus

Unit – 1: Uniform distribution and Cauchy distributions
Uniform distribution – Definition – Mean and Variance - M.G.F - C.F - P.G.F - Distribution function. Mean Deviation about mean
Cauchy Distribution – Definition – C.f – Additive Property.

Unit – 2: Exponential Distribution
Exponential distribution – Definition - – Mean and Variance - M.G.F - C.F - C.G.F – skewness - kurtosis - Distribution function - Memory less property- Additive Property.

Unit – 3: Gamma and Beta Distributions
Gamma Distribution – Definition - M.G.F- C.F - Mean and Variance – Skewness- Kurtosis – C.G.F – Relationship between moments and cumulates of gamma distribution - Additive property.
Beta Distribution of first and second kind – Definitions – Means – Variances – Relationship between Beta and Gamma Distributions

Unit – 4: Normal Distribution
Normal Distribution – Definition – Chief Characteristics - Importance - M.G.F - C.F- C.G.F - Additive property - Skewness - Kurtosis - Obtain mean, median and mode – ratio between QD, MD, SD – Mean deviation about mean - Even and Odd order moments about mean - Linear combination of normal variates - Points of inflexion of normal probability curve – Area property – Problems

Unit – 5: Limit Theorems:
Limiting form of Binomial to Normal – limiting form of Poisson to Normal – Limiting form of Gamma to Normal distributions – Weak Law of Large Numbers(WLLN) - Strong Law of Large Numbers(SLLN) – Convergence in probability and distribution – Central Limit theorem - Lindberg – Levy and Lyapunov's Central Limit Theorems - Applications,

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COURSE 6: THEORETICAL CONTINUOUS DISTRIBUTIONS

Practical Credits: 1 2 hrs/week

III. Syllabus

1. Calculation of moments of Uniform distribution.
2. Calculation of skewness and kurtosis of Uniform distribution.
3. Fitting of Cauchy distribution
4. Fitting of Exponential distribution.
5. Fitting of Normal distribution – Area method.
6. Fitting of Normal distribution – Ordinates method.

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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MODEL PAPER

COURSE 6: THEORETICAL CONTINUOUS DISTRIBUTIONS

Time: 3hrs **Max.Marks : 70**

Section – A

Answer any Five of the following questions. **5X4=20M**

1.

2.

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Section – B

Answer All Questions. Each Question carries 10 Marks. **5X10=50M**

9. a)

Or

b)

10. a)

Or

b)

11. a)

Or

b)

12. a)

Or

b)

13. a)

Or

b)

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COURSE 7: STATISTICAL METHODS

Theory Credits: 3 3 hrs/week

I. Learning Outcomes

After successful completion of the course students will be able to:
1. To get the knowledge of estimating future values by using curve fitting.
2. To calculate the relationship between bivariate data.
3. To find the relationship about the multivariate data.
4. To acquaint about the forecasting of the data by using regression techniques.
5. To find the association of the categorical data by using attributes.

II. Syllabus

Unit – 1: Curve fitting
Bivariate data - Principle of least squares - Fitting of n^{th} degree polynomial - Fitting of straight line - Fitting of Second degree polynomial or Parabola - Fitting of family of exponential curves and Power curve.

Unit – 2: Correlation
Meaning - Types of Correlation - Measures of Correlation – Scatter diagram - Karl Pearson's Coefficient of Correlation - Properties - Rank Correlation – Coefficient of Rank Correlation (with and without ties) – Properties - Bivariate frequency distribution - Correlation coefficient for bivariate data and problems.

Unit – 3: Multiple and Partial Correlation :
Coefficient of concurrent deviation - probable error and Standard Error - Coefficient of determination - Multiple and Partial correlation coefficients (three variables only) - Properties and Problems- Correlation ratio.

Unit – 4: Regression
Concept of Regression - Linear and Non Linear regression - Linear Regression – Regression lines - Regression coefficients and its properties - Angle between two lines of regression - Regressions lines for bivariate data and simple problems. Correlation vs regression.

Unit – 5: Attributes
Notations – Class - Order of class frequencies - Ultimate class frequencies - Consistency of data - Conditions for consistency of data for 2 and 3 attributes only - Independence of attributes - Association of attributes and its measures - Relationship between association and colligation of attributes - Contingency table - Square contingency**,** Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

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COURSE 7: STATISTICAL METHODS

Practical Credits: 1 2 hrs/week

III. Syllabus

1. Fitting of straight line
2. Fitting of parabola
3. Fitting of exponential curve $y = ae^{bx}$
4. Fitting of exponential curve $y = a\ b^{x}$
5. Fitting of power curve $y = a\ x^{b}$
6. Correlation coefficient and regression lines by direct method.
7. Correlation coefficient, regression lines by deviation method
8. Bivariate table.
9. Multiple and Partial correlation coefficients.
10. Yule's coefficient of association and colligation.
11. Square,Mean square, Coefficient of contingencies and Tschuprow's coefficient

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COURSE 7: STATISTICAL METHODS

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Section – A

Answer any Five of the following questions. **5X4=20M**

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Section – B

Answer All Questions. Each Question carries 10 Marks. **5X10=50M**

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Or

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(W.E.F. Academic Year 2024 - 25)
COURSE 8: INFERENTIAL STATISTICS

Theory Credits: 3 3 hrs/week

I. Learning Outcomes

After successful completion of the course students will be able to:
1. To acquaint with estimator, estimates, estimation techniques and its properties.
2. To acquire knowledge of testing the hypothesis of different distributions.
3. To learn about the large sample techniques by using various tools.
4. To learn about the small sample techniques by using various tools.
5. To deal with the situation where there is no parameters to the distributions.

II. Syllabus

Unit – 1:Fundemental Concepts and Exact sampling Distributions
Population – Sample - Sampling - Parameter- Statistic – Sampling Distribution – Standard error and properties – Null hypothesis – Alternative Hypothesis – Level of Significance – Degrees of freedom
Student-t, F, $\chi 2$ distributions – Definitions- Properties – Uses – Relation ships

Unit – 2: Testing of Hypothesis
Concepts of simple hypotheses – Composite hypothesis - Two types of errors – Critical Region - Power of the test – Best critical region - One and two tailed tests - Neyman- Pearson's lemma Applications – Theorems in case of Binomial, Poisson, Exponential and Normal distributions - Problems

Unit – 3 : Theory of estimation
Estimator and estimate - Criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency - Statement of Neyman's factorization theorem - Maximum likelihood Estimation(M.L.E) – Properties – Estimation of parameters in Binomial, Poisson and Normal populations by MLE method - Method of moments – Interval Estimation and Confidence Intervals for Mean and Variance for normal population.

Unit – 4: Large sample Tests
Differences between Large and Small samples - Large sample test for single mean and difference of two means – Test for single Standard deviation and difference of two standard deviations - Test for single proportion and difference of two proportions - Test for correlation coefficient – Fisher Z transformation – Test for two correlation coefficients using Fisher Z-Test

Unit – 5: Small Sample and Non-parametric tests
Small Sample tests -Student t-test for single mean, difference of means and paired t-test - F-test for equality of variances - $\chi 2$ test for goodness of fit and independence of attributes - $\chi 2$ test for single variance
Non-Parametric tests – Assumptions - Advantages and disadvantages – Sign test-One sample and two sample Run test – Median test - Wilcoxon – Mann – Whitney U-test

SEMESTER-III

STATISTICS MAJOR
COURSE 8: INFERENTIAL STATISTICS

Practical Credits: 1 2 hrs/week

III. Syllabus

1. Large sample test for single mean
2. Large sample test for difference of means
3. Large sample test for single proportion
4. Large sample test for difference of proportions
5. Large sample test for difference of standard deviations
6. Fisher Z- test for correlation coefficients
7. Small sample test for single mean
8. Small sample test for difference of means
9. Paired t-test (paired samples).
10. Small sample test for difference of variances (F test)
11 $\chi 2$ test for goodness of fit of Binomial Distribution
12. $\chi 2$ test for independence of attributes
13. Sign Test
14. Two sample run test
15. Median test

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COURSE 8: INFERENTIAL STATISTICS

Time: 3hrs **Max.Marks : 70**

Section – A

Answer any Five of the following questions. **5X4=20M**

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Section – B

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