

## PROBABILITY AND STATISTICS

### UNIT I - SINGLE RANDOM VARIABLES AND PROBABILITY DISTRIBUTION

**Probability** - Introduction of Probability, Set Definitions, Operations on Sets, Laws of Algebra of sets.

**Random variable** - Introduction of Random variable, Definition of Random Variable, Discrete, Continuous and Mixed Random Variable, Conditions for a Function to be a Random Variable. **Discrete**

**Random Variable** - Probability Distribution Function, Probability of Mass function, Properties of Discrete Random Variable, Example problems. **Continuous Random Variable** - Probability Distribution Function, Probability Density function, Properties of Continuous Random Variable, Example problems.

**Mathematical Expectation And Moments** - Introduction, Expected Value of a Random Variable, Properties, Example problems, Function of a Random Variable, Moments about the Origin, Central Moments. **Moment Generating Function** - Introduction of Moment Generating Function, Property of Moment Generating Function, Example problems.

**Binomial distribution** - Introduction to binomial Distribution, Mean of binomial distribution, Variance of binomial distribution, Moment generating function, Example problems. **Poisson distribution**- Introduction to poisson distribution, Mean of Poisson Distribution, Variance of Poisson Distribution, Moment Generating function, Properties of Poisson Distribution 1 and 2, Example problems.

**Normal/Gaussian Distribution** - Introduction to Gaussian/Normal Distribution, Application of Gaussian distribution, Characteristics of the Gaussian distribution, Normal distribution as a limiting form of Binomial Distribution, Example problems.

### UNIT II - MULTIPLE RANDOM VARIABLES, CORRELATION AND REGRESSION

**Joint Distribution Function** - Introduction, Properties, Example problems. **Joint Density Function** - Introduction, Properties, Example problems. **Conditional Distribution and Density Function** -

Introduction of Conditional Distribution Function, Properties of Conditional Distribution Function, Introduction of Conditioning Event, Introduction of Conditional Density Function, properties of Conditional Density Function, Point Conditioning, Internal Conditioning, Example problems. **Covariance and Correlation** - Covariance, Correlation, Correlation Analysis, Types of Correlation. **Methods of Studying Correlation** - Methods of Studying Correlation, Scatter diagram method, Graphic method,

Karl Pearson's coefficient of correlation, Example problems. **Correlation of Grouped Data** - Correlation of Grouped Data, Example problems. **Rank Correlation** - Rank Correlation, Example problems, Repeated Ranks, Example problem. **Regression Analysis** - Regression Analysis, Regression Coefficient, Example problems. **Angle Between Two Regression Lines** - Angle Between Two Regression Lines, Example problem. **Multiple correlation and regression** - Introduction, Multiple regression analysis, Example problems.

### UNIT III- SAMPLING DISTRIBUTIONS AND TESTING OF HYPOTHESIS

**Sampling Distribution** - Introduction to Sampling Distribution, Types of Sampling, Sampling Distribution of Means, Standard Error, Example problems. **Parameter Estimation** - Theory of Estimation, Point

Estimation, Interval Estimation, Introduction to Properties of Estimators, Example problems, Bayesian Estimation. **Procedure for testing hypothesis** - Set up a hypothesis, Computation of Test Statistic, Types of error in hypothesis testing, Level of Significance and Critical region, Two tailed and one tailed test, Critical value and Decision, Example problem. **Large sample test** - Introduction to Large Sample Test, Test of Significance for single Mean, Example problems, Test of significance for difference of means, Example problems, Test of significance for difference of standard deviation, Example problems. **Test of Significance for Single Proportion** - Test of Significance for Single Proportion, Example problems. **Test of Significance for Difference of Proportions** - Test of Significance for Difference of Proportions, Example problems. **Small samples** - Introduction. **Student's t-distribution** - Student's t-distribution, Degrees of Freedom, Properties of t-distribution, Test of Significance for Single Mean, Example problems, Test of Significance for Difference Between Two Means, Example problems, Test of significance for Difference between two means (dependent samples), Example problems, Test of significance of an observed correlation Co-efficient, t-distribution Table. **F-test for equality of population variances** - F-test for equality of population variances, Snedecor's F-distribution, Example problems, F0.01-distribution Table, F0.05-distribution Table. **Chi-square Distribution** - Introduction, Properties of Chi-square Distribution, Application of Chi-square Distribution, Chi-square test for Goodness of fit, Conditions for Applying Chi-square test, Example problems, Chi-square test for Independence of Attributes, Example problems, Chi-square Distribution Table.

#### **UNIT IV - QUEUING THEORY**

**Arrival and Service Processes** - Introduction, Poisson Random Process, Steady State and Transient State Systems, Poisson Process, Arrival Theorem, Example problems. **Pure Birth and Death Process** - Pure Birth and Death Process, Derivation of Balance Equations. **Model I (M/M/1): ( $\infty$ /FIFO)** - M/M/1 Queueing Model, Parameters of M/M/1 Model, Parameters of M/M/1 Model, Parameters of M/M/1 Model, Little's Formulae and Facility Utilization, Example problems. **Model II (M/M/c): ( $\infty$ /FCFS)** - Multi server, infinite capacity queue, Average number of customers in the queue( $l_q$ ), Probability that and arrival has to wait [ $p(n \geq c)$ ], Average number of customer who have to actually wait ( $l_w$ ). **Model III (M/M/1): (N/FIFO)** - Model III (M/M/1): (N/FIFO), Example problems. **Model IV (M/M/C): (K/FCFS)** - Model IV (M/M/C): (K/FCFS), Example problems.

#### **UNIT V - STOCHASTIC PROCESSES**

**Random Processes** - Introduction, Classification of Random Process, Distribution and Density Functions, Statistical (Ensemble) Averages. **Stationary Random Process** - Stationary Random Process, Example problems. **Markov Process** - Introduction, Markov Chain, Transition Probability, Homogeneous Markov Chain, Chapman Kolmogorov Theorem, Classification of states of Markov Chains, Example problems.