K. T. S. P. Mandal's
Hutatma Rajguru Mahavidyalaya , Rajgurunagar
Department Of Statistics
Teaching Plan
Academic Year 2018-19

Sr.No	Class	Paper	Name of Teacher
1	F.Y.B.Sc	Descriptive Statistics	Thorat S.R.
2	F.Y.B.Sc	Discrete Probability Distributions	Thorat S.R.

Paper : Descriptive Statistics **Class: F.Y.B.Sc**

Month	Topic	Subtopic
June/July 2018	1**. Introduction to Statistics**	1.1 Meaning of Statistics as a Science. 1.2 Importance of Statistics. 1.3 Scope of Statistics: 1.4 Statistical organizations in India and their functions:
	2. Population and Sample	2.1 Types of characteristics: 2.2 Types of data: 2.3 Notion of a statistical population 2.4 Methods of sampling
August 2018	**3. Summary Statistics**	3.1 Classification 3.2 Measures of Central Tendency Arithmetic Mean (A.M.), median, mode Partition Values: Quartiles, Deciles and Percentiles Geometric Mean, Harmonic Mean, Weighted Mean 3.3 Measures of Dispersion Range, Semi-interquartile range, Mean deviation, Variance and standard deviation, Mean squared deviation coefficient of variation

Sept/Oct 2018	**4. Moments, Skewness and Kurtosis**	4.1 Raw moments (m'r) for ungrouped and grouped data 4.2 Central moments (mr) for ungrouped and grouped data 4.3 Relations between central moments and raw moments, upto 4-th order 4.4 Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution. 4.5 Bowley's coefficient of skewness 4.6 Karl Pearson's coefficient of skewness. 4.7 Measures of skewness based on moments ($\beta 1, \gamma 1$). 4.8 Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions. 4.9 Measures of kurtosis based on moments ($\beta 2, \gamma 2$).
Nov/ Dec 2018	**5. Theory of Attributes**	5.1 Attributes: 5.2 Consistency of data upto 2 attributes. 5.3 Concepts of independence and association of two attributes. 5.4 Yule's coefficient of association (Q), $-1 \leq Q \leq 1$, interpretation.
January 2019	**6. Correlation**	6.1 Bivariate data, Scatter diagram and interpretation. 6.2 Concept of correlation between two variables 6.3 Covariance between two variables (m11) : 6.4 Karl Pearson's coefficient of correlation (r) 6.5 Spearman's rank correlation coefficient: compute Karl Pearson's correlation coefficient between ranks.
February 2019	**7. Linear Regression Model**	7.1 Meaning of regression 7.2 Simple linear regression model: $Y= a + b X + \varepsilon$ 7.3 Concept of residual, plot of residual, coefficient of determination
Feb/Mar 2019	**8. Fitting of curves to the bivariate data Fitting of curves to the bivariate data**	8.1 Fitting of line ($Y = a + b X$), 8.2 Fitting of second degree curve 8.3 Fitting of exponential uncorrelatedness of two variables. 8.6 Variance of linear combination of variables Var($aX + bY$).Correlation coefficient

	9 Index Numbers	9.1 Introduction. 9.2 Definition and Meaning. 9.3 Problems/considerations in the construction of index numbers. 9.4 Simple and weighted price index 9.5 Simple and weighted price index 9.6 Laspeyre's, Paasche's and Fisher's Index numbers. 9.7 Consumer price index number (i) family budget method (ii) aggregate expenditure method. 9.8 Shifting of base, splicing, deflating, purchasing power. 9.9 Description of the BSE sensitivity and similar index numbers.

Paper : Discrete Probability Distributions **Class: F.Y.B.Sc**

Month	Topic	Subtopic
June/July 2018	**1. Review of probability, conditional probability, independence**	1.1 Experiments/Models, Ideas of deterministic and non-deterministic models. Random Experiment, concept of statistical regularity. 1.2 Definitions of - (i) Sample space, (ii) Discrete sample space: finite and countably infinite, (iii) Event, (iv) Elementary event, (v) Complement of an event. (vi) Certain event (vii) Impossible event 1.3 Concept of occurrence of an event. 1.4 Algebra of events and its representation in set theory notation. Occurrence of following events. (i) at least one of the given events, (ii) none of the given events, (iii) all of the given events, (iv) mutually exclusive events, (v) mutually exhaustive events, (vi) exactly one event out of the given events. 1.5 Classical definition of probability and its limitations.

		1.6 Probability model, probability of an event, equiprobable and non-equiprobable sample space, 1.7 Axiomatic definition of probability. 1.8 Definition of conditional probability of an event. 1.9 Definition of independence of two events $P(A \cap B) = P(A) \cdot P(B)$ 1.10 Pairwise independence and mutual independence for three events 1.11 Multiplication theorem $P(A \cap B) = P(A) \cdot P(B\|A)$. Generalization to $P(A \cap B \cap C)$.
August 2018	**2. Bayes' Theorem** **3. Univariate Probability Distributions (Defined on Discrete Sample Space)**	2.1 Partition of the sample space 2.2 Proof of Bayes' theorem. Applications of Bayes' theorem in real life 3.1 Concept and definition of a discrete random variable. 3.2 Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.), $F(\cdot)$ of discrete random variable, properties of c.d.f.. 3.3 Mode and median of a univariate discrete probability distribution
Septmber 2018	**4. Mathematical Expectation (Univariate Random Variable)**	4.1 Definition of expectation (Mean) of a random variable, expectation of a function of a random variable, m.g.f. and c.g.f. Properties of m.g.f and c.g.f. 4.2 Definitions of variance, standard deviation (s.d.) and Coefficient of variation (c.v.) of univariate probability distribution, effect of change of origin and scale on mean, variance and s.d. 4.3 Definition of raw, central and factorial raw moments of univariate probability Distributions and their interrelations **(**without proof). 4.4 Coefficients of skewness and kurtosis based on moments.

October 2018	**5. Some Standard Discrete Probability Distributions - I**	5.1 Degenerate distribution, mean and variance 5.2 Uniform discrete distribution, p.m.f., c.d.f., mean, variance, real life situations, comments on mode and median 5.3 Bernoulli Distribution: p.m.f., mean, variance 5.4 Binomial Distribution: p.m.f., mean, variance 5.5 Hypergeometric Distribution : p.m.f., Computation of probability, situations where this distribution is applicable, binomial approximation to hypergeometric probabilities, mean and variance of the distribution
Nov/ Dec 2018	**6. Some Standard Discrete Probability Distributions - II**	6.1 Poisson distribution: m.g.f. and c.g.f. Moments, mean, variance, skewness and kurtosis 6.2 Geometric distribution: Mean, variance, m.g.f. and c.g.f.
January 2019	**7. Bivariate Discrete Probability Distribution**	7.1 Definition of two-dimensional discrete random variable, its joint p.m.f. and its distribution function and their properties 7.2 Computation of probabilities of events in bivariate probability distribution. 7.3 Concepts of marginal and conditional probability distributions. 7.4 Independence of two discrete random variables based on joint and marginal p.m.f.s
Feb/Mar 2019	**8. Mathematical Expectation (Bivariate Random Variable)**	8.1 Definition of raw and central moments, m.g.f, c.g.f. 8.2 Theorems on expectations .8.3 Conditional expectation. 8.4 Definitions of conditional mean and conditional variance. 8.5 Definition of covariance, coefficient of correlation, independence and uncorrelatedness of two variables. 8.6 Variance of linear combination of variables Var(aX + bY).Correlation coefficient

Thorat S.R.

Sr.No	Class	Paper	Name of Teacher
1	F.Y.B.C.S.	Statistical Methods-I	Wayal.V.M
2	S.Y.B.Sc (Sem-I)	Continuous Probability Distributions-I	Wayal.V.M
3	S.Y.B.Sc (Sem-I)	Sampling distributions and Inference	Wayal.V.M
4	F.Y.B.C.A	Computer Applications in Statistics	Wayal.V.M

Paper: Statistical Methods-I **Class: F.Y.B.C.S**

Month	Topic	Subtopic
July 2018	**1.Data Condensation and graphical methods**	1.1 Raw data, attributes and variables, discrete and continuous variables. 1.2 Presentation of data using frequency distribution and cumulative frequency distribution 1.3 Graphical presentation of frequency distribution- histogram, stem and leaf chart, less than and more than ogive curves. 1.4 Numerical problems related to real life situations.
	2. Review/ Revision of Descriptive Statistics	2.1 Measures of central tendency: Mean, Mode, Median Examples where each of these is most appropriate 2.2 Partition values: Quariles, Deciles, Percentiles, Box plot 2.3 Measures of Dispersion: Variance, Standard deviation, Coefficient of variation
August 2018	**3.Moments**	3.1 Raw and central moments 3.2 Relation between raw and central values upto fourth order 3.3 Numerical problems related moments 3.1 Concept and definition of a discrete random variable.
	4. Measures of Skewness and Kurtosis	4.1 Concept of symmetric frequency distribution, skewness, positive and negative skewness 4.2 Measures of skewness- Pearson's measure,

	Discrete Sample Space)	Bowley's measure (β_1, γ_1) 4.3 kurtosis of a frequency distribution, Measures of kurosis (β_2, γ_2) based upon moments, types of kurtosis: (β_1, γ_1)tokurtic , platykurtic, mesokurtic 4.5 Numerical problems
Septmber 2018	**5. Discrete Random Variable**	5.1 Definition of random variable and discrete random variable 5.2 Definition of probability mass function, distribution function and its properties 5.3 Definition of expectation and variance, theorem on expectation 5.4 Determination of median and mode using p.m.f. 5.5 Numerical problems
Sept/Oct 2018	**6. Standard Discrete Distributions**	6.1 Discrete Uniform Distribution: definition, mean, variance 6.2 Bernoulli Distribution 6.3 Binomial Distribution 6.4 Geometric Distribution: 6.5 Poisson Distribution: 6.6 Illustration of real life situations 6.7 Numerical problems
Nov/ Dec 2018	**7. Correlation (for bivariate raw data)**	7.1 Bivariate data, scatter diagram 7.2 correlation 7.3 Karl Pearson's coefficient of correlation, limit of r 7.4 interpretation of r, coefficient of determination, Auto correlation 7.5 Numerical problems
Dec 2018	**8.Regression**	8.1 Regression 8.2 linear Regression 8.3 Fitting of straight line using least square method 8.4 Properties of Regression coefficients 8.5 Non linear Regression: second degree curve, growth curve 8.6 Residual plot, mean residual sum of squares 8.7 Numerical problems
Jan/Feb 2019	**9. Multiple and partial correlation and Regression (for trivariate data)**	9.1 Yule's notation and concept of multiple regression 9.2 Fitting of multiple Regression plane 9.3 Partial Regression coefficient 9.4 Multiple correlation coefficient 9.5 Partial correlation coefficient

		9.6 Numerical problems
Feb 2019	**10. Time Series**	10.1 Meaning and utility 10.2 Component of Time series 10.3 Additive and Multiplicative models 10.4 Methods of estimating trend : moving average method, least square method and exponential smoothing method 10.5 Elimination of trend using additive and multiplicative models 10.6 Simple time series models 10.7 Numerical problems

Paper : Continuous Probability Distributions-I Class: S.Y.B.Sc (Sem-I)

Month	Topic	Subtopic
July 2018	**1.Continuous Univariate Distributions:**	1.1 Continuous sample space: Definition, illustrations. Continuous random variable: Definition, probability density function (p.d.f.), cumulative distribution function (c.d.f.), properties of c.d.f. (without proof), probabilities of events related to random variable. 1.2 Expectation of continuous r.v., expectation of function of r.v. E[g(X)], mean, variance, geometric mean, harmonic mean, raw and central moments, skewness, kurtosis. 1.3 Moment generating function(M.G.F.):Definition and properties,cumulant generating function (C. G. F.) : definition, properties. 1.4 Mode, median, quartiles. 1.5 Probability distribution of function of r. v.: Y = g(X) using i) Jacobian of transformation for g(.) monotonic function and one-to-one, on to functions, ii) Distribution function for $Y = X^2$, Y = |X| etc., iii) M.G.F. of g(X).
August 2018	**2.Continuous Bivariate Distributions:**	2.1 Continuous bivariate random vector or variable b(X, Y): Joint p. d. f. , joint c. d. f , properties (without proof), probabilities of events related to r.v. (events in

		terms of regions bounded by regular curves, circles, straight lines). Marginal and conditional distributions. 2.2 Expectation of r.v., expectation of function of r.v. E[g(X, Y)], joint moments, Cov (X,Y), Corr (X, Y), conditional mean, conditional variance, E[E(X|Y = y)] = E(X), regression as a conditional expectation. 2.3 Independence of r. v. (X, Y) and its extension to k dimensional r. v. Theorems on expectation: i) E(X + Y) = E(X) + E(Y), (ii) E(XY) = E(X) E(Y), if X and Y are independent, generalization to k variables. E(aX + bY + c), Var (aX + bY + c). 2.4 M.G.F. : $M_{X,Y}(t_1, t_2)$, properties, M.G.F. of marginal distribution of r. v.s., properties $M_{X,Y}(t_1, t_2) = M_X(t_1, 0)\, M_Y(0, t_2)$, if X and Y are independent r. v.s., $M_{X+Y}(t) = M_{X,Y}(t, t)$, $M_{X+Y}(t) = M_X(t)\, M_Y(t)$ if X and Y are independent r.v.s. 2.5 Probability distribution of transformation of bivariate $U = f_1(X, Y)$, $V = f_2(X, Y)$.
Septmber 2018	**3.Standard Univariate Continuous Distributions:**	**3.1 Uniform or Rectangular Distribution:** Probability density function (p.d.f.) Notation : X ~ U[a, b] . p. d. f., sketch of p. d. f., c. d. f., mean, variance, symmetry. Distribution of i) $X - a$, ii) $b - X$, iii) Y = F(X), where F(X) is the c. d. f. of continuous r. v. X. Application of the result to model sampling. (Distributions of X + Y, X – Y, XY and X/Y are not expected.)

		3.2 Normal Distribution: p. d. f. curve, identification of scale and location parameters, nature of probability curve, mean, variance, M.G.F., C.G.F., central moments, cumulants, b_1 , b_2 , g_1, g_2 , median, mode, quartiles, mean deviation, additive property, computations of normal probabilities using normal probability integral tables, probability distribution of : i) $X - m$, ii) aX + b, iii) aX + bY + c, iv) X^2 , where X and Y are independent normal variates. Probability distribution of X , the mean of n i. i. d. $N(m, s^2)$ r. v s. Normal probability plot, q-q plot to test normality. Model sampling from Normal distribution using (i) Distribution function method and (ii) Box-Muller transformation as an application of simulation. Statement and proof of central limit theorem (CLT) for i. i. d. r. v. s with finite positive variance.(Proof should be using M.G.F.) Its illustration for Poisson and Binomial distributions. **3.3 Exponential Distribution:** Probability density function (p. d. f.) Nature of p. d. f., density curve, interpretation of a as rate and $1 / a$ as mean, mean, variance, M. G. F., C. G. F., c. d. f., graph of c. d. f., lack of memory property, median, quartiles. Distribution of min(X, Y) with X, Y i. i. d. exponential r. v. s.
Sept/Oct 2018		**3.4 Gamma Distribution:** Probability density function (p. d. f.) Nature of probability curve, special cases: i) $a = 1$, ii) $l = 1$, M. G. F., C. G. F., moments, cumulants, b_1 , b_2 , g_1, g_2 , mode, additive property. Distribution of sum of n i. i. d. exponential variables. Relation between distribution function of Poisson and Gamma variates.

Paper : Sampling Distributions And Inference Class: S.Y.B.Sc (Sem-II)

Month	Topic	Subtopic
Dec 2018	**1.Chi-square Distribution** **2.Student's t-distribution**	Definition of Chi-squarer. v. as sum of squares of i. i. d. standard $n$normal variables Derivation of p. d. f. of with n degrees of freedom (d. f.) using M. G. F., nature of p. d. f. curve, computations of probabilities using tables of distribution. mean, variance, M. G. F., C. G. F., central moments, mode, additive property. χ_n Definition of T r. v. with n d. f. Derivation of p. d. f., nature of probability curve, mean, variance, moments, mode, use of tables of t-distribution for calculation of probabilities, statement of normal approximation.
Jan 2019	**3.Snedecore's F-distribution:** **4. Sampling Distributions:**	Definition of F r. v. with n_1 and n_2 d. f. Derivation of p. d. f., nature of probability curve, mean, variance, moments, mode. Distribution of 1/F use of tables of F-distribution for calculation of probabilities. Interrelations between Chi-Square , T and F distribution. Random sample from a distribution as i. i. d. r. v.s. Sampling distribution of a statistic. Distribution of sample mean from normal, exponential and gamma distribution, Notion of standard error of a statistic. Independence of $\bar{X}$ and S^2
Feb/March 2019	**5.Test of Hypothesis:**	Tests based on chi-square distribution: Test for independence of two attributes arranged in 2 X2 contingency table. (With Yates' correction). Test for independence of two attributes arranged in r X s contingency table, McNemar's test Test for 'Goodness of Fit'. (Without rounding-off the

		expected frequencies). d) Test for population variance equal to specified value. when i) mean is known , ii) mean is unknown. Tests based on t-distribution: t-tests for population means : i) one sample and two sample tests for one sided and two sided alternatives. Confidence interval. Paired t-test for one-sided and two-sided alternatives. Test based on F-distribution: Test for equality of two population variance. when i) means are known, ii) means are unknown.

Paper : Computer Applications in Statistics Class: F.Y.B.C.A

Month	Topic	Subtopic
December 2018	**1. Methods of counting and Fundamental Principals of Counting**	1. Principals of counting 2. Permutations and combinations 3. Examples and problems
	2. Elements of Probability Theory	1. Random experiments, sample space, events, algebra of events. 2. Classical definition of probability, addition theorem of probability, Independence of events, Simple numerical problems.
Jan / Feb 2019	**3.Standard Discrete Distributions**	1.Disctrete Uniform : Probability Distribution, c.d.f. mean ,variance(without proof) 2.Bernoulli : probability distribution , mean, variance 3. Binomial : probability distribution, c.d.f., mean, variance, 4. Examples and problems.
March 2019	**4.Simulation Techniques**	1. Random Number Generator 2. Model sampling from discrete uniform and binomial distributions 3. Monte Carlo Simulation examples and problems.

Wayal V.M.

Sr.No	Class	Paper	Name of Teacher
1	F.Y.B.C.S.	Statistical Methods-II	Shah N.S.
2	S.Y.B.Sc (Sem-I)	Discrete Probability Distributions, Time series and R software	Shah N.S.
3	S.Y.B.Sc (Sem-II)	Statistical Methods and Use of R software	Shah N.S.
4	F.Y.B.Com	Business Mathematics and Statistics	Shah N.S.

Paper : **Statistical Methods-II** **Class: F.Y.B.C.S**

Month	Topic	Subtopic
July 2018	**1. Detailed Review / Revision of Theory of Probability**	1.1 Counting Principles, Permutation, and Combination. 1.2 Deterministic and non-determination models. 1.3 Random Experiment, Sample Spaces (finite and countably infinite) 1.4 Events: types of events, Operations on events. 1.5 Probability - classical definition, probability models, axioms of probability, probability of an event. 1.6 Theorems of probability (with proof) i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A') = 1$ iii) $P(A) \leq P(B)$ when $A \subset B$ iv) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ 1.7 Numerical problems related to real life situations
August 2018	**2. Advanced Theory of Probability**	2.1Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B)=P(A).P(B\|A)$ 2.2 Bayes' theorem (without proof) 2.3 Concept of Posterior probability, problems on posterior probability. 2.4 Definition of sensitivity of a procedure, specificity of a procedure. Application of Bayes' theorem to design a procedure for false positive and false negative. 2.5 Concept and definition of independence of two events. 2.6 Numerical problems related to real life situations.

Sept /Oct 2018	**3. Continuous Random Variable**	3.1 Definition of continuous random variable (r. v.), 3.2 Probability density function (p.d.f.), 3.3 Cumulative distribution function (c.d.f.), its properties. 3.4 Calculation of mean, mode, median, variance, standard deviation for continuous r. v. 3.5 Numerical problems related to real life situations
Dec 2018	**4.Standard Continuous Probability Distributions** **5.Concepts and Definitions Related to testing of Hypothesis**	1.Uniform Distribution: p.d.f., mean, variance, nature of probability curve. 2. Exponential Distribution: p.d.f., mean, variance, nature of probability curve, lack of memory property. 3. Normal Distribution: Statement of p.d.f , nature of density curve, standard normal distribution, symmetry, computations of probabilities using normal probability table, normal approximation to binomial and poisson distribution, Central limit theorem, normal probability plot. 4. Pareto Distribution: p.d.f., mean, variance, applications 5. Numerical problems related to real life situations. 1.Definitions: population, statistics, RSWR,SRSWOR, Random sample, parameter, statistic, standard error of estimator. 2. Concepts: null hypothesis, alternative hypothesis, critical region, level of significance, type I error, type II error, one and two sided tests, p-value.
Jan 2019	**6. Large Sample Tests** **7.Test based on t-distribution**	1. Test for population mean 2. Test for equality of two population mean 3. Test for population proportion 4. Test for equality of population proportion 5. Numerical problems related to real life situations. 1. One sample test concerning mean 2.Testing for equality of means of two populations 3. Paired t-test

		4. Test for significance of correlation coefficient for bivariate raw data 5. Test for significance of regression coefficient for bivariate raw data 5. Numerical problems related to real life situations.
Feb 2019	**8. Test based on Chi-square distribution** **9.Non parametric tests** **10. Simulation**	1. chi-square test for goodness of fit 2. Test for independence of attributes. 3. Test for significance of variation for a population. 4. Numerical problems related to real life situations. 1.Run test 2. Sign test 3.Kolmogrov-Smirnov test 4. Mann-whitney test 5. Numerical problems related to real life situations. 1.Introduction, merits and demerits and pitfall 2. Psedo-random number generator 3. Model Sampling from uniform and exponential distribution

Paper : Discrete Probability Distributions, Time series and R software

Class: S.Y.B.Sc (Sem-I)

Month	Topic	Subtopic
July 2018	**1. Statndard Discrete Distributions**	**1.1 Negative Binomial Distribution:** Probability mass function (p. m. f.) Notation: X ~ NB (k, p). Nature of p. m. f., negative binomial distribution as a waiting time distribution, M.G.F., C.G.F., mean,

		variance, skewness, kurtosis (recurrence relation between moments is not expected). Relation between geometric and negative binomial distribution. Poisson approximation to negative binomial distribution. Real life
August 2018	**2. Advanced Theory of Probability**	**1.2 Multinomial Distribution:** Probability Mass function, Notation use of MGF to obtain means, variances, covariances, total correlation coefficients, multiple and partial correlation coefficients for k= 3, univariate marginal distribution, distribution of $X_i + X_j$, conditional distribution of X_i given $X_i + X_j = r$, variance – covariance matrix, rank of variance – covariance matrix and its interpretation and real life situations and applications. **1.3 Truncated Distributions:** Concept of Truncated distribution, truncation to the right, left and on both sides. Binomial distribution B(n, p) left truncated at X=0 (value zero is discarded), its p.m.f., mean, variance . Poisson distribution P(m) left truncated at X=0 (value zero is discarded), its p.m.f. , mean, variance. Real life situations and applications.
Sept /Oct 2018	**3. Fundamentals of R-Software:**	3.1 Introduction to R, features of R, starting and ending R session, getting help in R, R commands and case sensitivity. 3.2 Vectors and vector arithmetic creation of vectors using functions c, seq, rep Arithmetic operations on vectors using operators +, - , * , / , ^ .

	2.Time Series:	Numerical functions: log10, log, sort, max, min, unique, range, length, var, prod, sum, summary, fivenum etc. accessing vectors 3.3 Data frames : creation using data.frame, subset and transform commands. 3.4 Resident data sets : Accession and summary 3.5 p, q, d, r functions. 2.1 Meaning and utility of time series, Components of time series: trend, seasonal variations, cyclical variations, irregular (error) fluctuations or noise. 2.2 Exploratory data analysis: Time series plot to (i) check any trend, seasonality in the time series (ii) learn how to capture trend. 2.3 Methods of trend estimation and smoothing: (i) moving average, (ii) curve fitting by least square principle, (iii) exponential smoothing. 2.4 Measurement of seasonal variations : i) simple average method, ii) ratio to moving average method, iii) ratio to trend where trend is calculated by method of least squares. 2.5 Choosing parameters for smoothing and forecasting. 2.6 Forecasting based on exponential smoothing. 2.7 Double exponential smoothing i.e. Holt-Winters method 2.8 Fitting of autoregressive model AR (1), plotting of residuals. 2.9 Data Analysis of Real Life Time Series:

Paper : Statistical Methods and Use of R software

Class: S.Y.B.Sc (Sem-II)

Month	Topic	Subtopic
Dec 2018	**I) Multiple Linear Regression Model:**	Definition of multiple correlation coefficient $R_{Y.XX}$. Derivation of the expression for the multiple correlation coefficient. Properties of multiple correlation coefficient $1\,2$ Interpretation of coefficient of multiple determination Definition of partial correlation coefficient Fitting of regression plane of Y on X_1 and X_2, by the method of least squares; obtaining normal equations, solutions of normal equations Residuals : Definition, order, derivation of variance, properties. Definition and interpretation of partial regression coefficients Properties of partial correlation coefficient:
Jan 2019	**II) Tests of Hypothesis**	Statistics and parameters, statistical inference : problem of estimation and testing of hypothesis. Estimator and estimate. Unbiased estimator (definition and illustrations only). Statistical hypothesis, null and alternative hypothesis, Simple and composite hypothesis, one sided and two sided alternative hypothesis, critical region, type I error, type II error, power of the test, level of significance, p-value. Two sided confidence interval, finding probabilities of type I error and type II error when critical regions are specified . i) Test for population mean equal to specified value ii) Test of equality of two population mean iii) Test for population proportion equal to specified value. iv) Test for equality of two population proportions.

Feb/ March 2019	**III) Tests of Hypothesis using R-Software**	Drawing a sample from population using SRSWR, SRSWOR. Tests: Z test, t test, F test and tests for proportions.
	IV) Dempgraphy	Vital events, vital statistics, methods of obtaining vital statistics, rates of vital events, sex ratios, dependency ratio. Death/Mortality rates: Crude death rate, specific (age, sex etc.) death rate, standardized death rate (direct and indirect), infant mortality rate. Fertility/Birth rate: Crude birth rate, general fertility rate, specific (age, sex etc.) fertility rates, total fertility rate. Growth/Reproduction rates : Gross reproduction rate, net reproduction rate. Interpretations of different rates, uses and applications. Trends in vital rates as revealed in the latest census.
	IV) Queuing Model	M/M/1: FIFO as an application of exponential distribution, Poisson distribution and geometric distribution : Inter arrival rate , service rate (μ), traffic intensity ,queue discipline probability distribution of number of customers in queue, average queue length, average waiting time in: i) queue, ii) system.

Paper : **Business Mathematics and Statistics** **Class: F.Y.B.Com**

Month	Topic	Subtopic
July 2018	**1-Preliminaries**	Natural no & integers H.C.F & M.C.F fraction Laws of indices ratio & percentage, proportion
August 2018	**2-Interest**	simple interest compound interest EMI Examples
	3-Shares and Dividends	Concept of shares ,face value, market value , net asset value Equity shares and preference shares Dividend Bonus shares Examples
Sept 2018	**4-Population & sample**	Definition & concept of statistics scope of statistics concept of population &sample sampling method
	5-Measures of central tendency	Variables, classification of data frequency distribution graph mean ,median & mode examples
Nov 2018	**6-Profit and Loss**	cost price, market, selling price trade & cash discount commission & brokerage examples

Dec 2018	**7-Linear programming problems** **8-measures of Dispersion**	Definition formulation of lpp graphical method example concept of dispersion measures of dispersion measures of relative dispersion examples
Jan 2019	**9- correlation & regression**	Data, scatter diagram Karl pearson's coefficient correlation rank correlation regression examples
Feb 2019	**10-index number**	concept and construction of index number Laspeyers , paasches & fisher index no family budget & expenditure method sensex & nifty examples

Shah N.S.