ಕರ್ನಾಟಕ ಲೋಕಸೇವಾ ಆಯೋಗದಿಂದ ಆರ್ಥಿಕ ಮತ್ತು ಸಾಂಖ್ಯಿಕ ನಿರ್ದೇಶನಾಲಯದ ತಾಂತ್ರಿಕ ಹುದ್ದೆಗೆ (ಗ್ರೂಪ್ 'ಬಿ' ಸಹಾಯಕ ಸಾಂಖ್ಯಿಕ ಅಧಿಕಾರಿ) ನಡೆಸುವ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಯ ನಿರ್ದಿಷ್ಟ ಪತ್ರಿಕೆಗೆ ಸೂಚಿಸಲಾಗಿರುವ ಪಠ್ಯಕ್ರಮ(Syllabus)

I Subject : Economics

PAPER -1

Chapter:

1. The Framework of an economy; National Income Accounting.
2. Economic choice; Consumer behaviour-producer behaviour and market forms.
3. Investment decisions and determination of income and employment. Micro-economic models of income, distribution and growth.
4. Banking, Objective and instruments of Central Banking and Credit Policies in Planned developing economy.
5. Types of taxes and their impacts on the economy, the impacts of the size and content of budgets, objectives and Instruments of budgetary and fiscal policy in a planned developing economy.
6. International Trade Tariffs, The rate of exchange, The balance of Payments, International Monetary and Banking Institutions.

Economics

PAPER - II

1. The Indian Economy : Guiding Principles of Indian Economic Policy - Planned Growth and distributive justice - Eradication of poverty, The Institutional frame work of the Indian Economy-Federal Governmental structure-Agricultural and Industrial sectors, public and private sectors, National Income-its sector and regional distribution, Extent and incidence of poverty.
2. Agricultural Production : Agricultural Policy, Land reforms, Technological, Relationship with the Industrial Sector, with special reference to Karnataka.
3. Industrial Production : Industrial Policy, public and private sectors, Regional distribution, control of monopolies and monopolistic practices with special reference to Karnataka.
4. Pricing Policies for agricultural and industrial outputs, Procurement and public Distribution with special reference to Karnataka.
5. Budgetary trends and fiscal policy.
6. Monetary and credit trends and policy Banking and other financial institutions.
7. Foreign trade and the balance of payments.
8. Indian Planning; Objectives, strategy, experience and problems-with special reference to Karnataka.

II Subject : Mathematics

PAPER -1

Linear Algebra

Vector space, bases, dimension of a finitely generated space, 'Linear Transformations, Rank and nullity of a linear transformation, Cayley-Hamilton theorem, Eigenvalues and Eigen vectors.

Matrix of a linear transformation, Row and Column reduction. Echelon form. Equivalence, Congruence and similarity. Reduction to canonical forms.

Orthogonal, Symmetrical, skew-symmetrical, unitary, Hermitian and skew-Hermitian matrices-their eigenvalues, orthogonal and unitary reduction of quadratic and Hermitian forms. Positive definite quardratic forms, simultaneous reduction.

Calculus:

Real numbers, limits, continuity, differentiability, Mean-value theorem, Taylor's theorem, indeterminate forms, Maxima and Minima, Curve Tracing.

Asymptotes :

Functions of several variables, partial derivatives maxima and minima, Jocobian. Definite and indefinite integrals, Double and triple integrals (techniques only). Application to Beta and Gamma Functions. Areas, Volumes; centre of gravity.

Analytic Geometry of Two and Three Dimensions

First and second degree equations in two dimensions in Cartesian and polar coordinates, Plane, sphere, paraboloid, Ellipsoid, hyperboloid of one and two sheets and their elementary properties, curves in space, curvature and torsion, Frenet's formulae.

Differential Equations :

Order and Degree of a differential equaltion; differential equation of first order and first degree, variables separable. Homogeneous, linear and exact differential equations. Differential equations with constant coefficients. The complimentary function and the particular integral of e^{ax}, COS^{ax}, sinax, X^m, e^{ax}, Cosbx, e^{ax}, sinbx.

Vector, Tensor, Statics, Dynamics and Hydrostatics

(i) Vector Analysis - Vector Algebra, Differentation and Vector function of a scalar variable, Gradient, divergence and curl in Cartesian, cylindrical and spherical coordinates and their physical interpretation. Higher order derivaties. Vector identifies and Vector equations, Gauss and Stokes Theorems.

(ii) Tensor Analysis: Definition of a Tensor, transformation of coordinates, contravariant and covariact tensors. Addition and multiplication of tensors, contraction of tensors, Inner product, fundamental tensor, christoffel symbols, covariant differentiation. Gradient, Curl and divergence in tensor notation.

(iii) Statics - Equilibrium of a system of particles, work and potential energy. Friction, Common category. Principles of Virtual work. Stability of equilibrium. Equilibrium of forces in three dimensions,

(iv) Dynamics - Degree of freedom and constraints. Rectilinear motion. Simple harmonic motion. Motion in a plane. Projectiles. Constrained motion. Work and energy. Motion under impulsive forces. Kepler's laws. Orbits under central forces. Motion of varying mass. Motion under resistance.

(v) Hydrostatics - Pressure of heavy fluids, Equilibirum of fluids under given system of forces. Centre of pressure Thrust on curved surfaces. Equilibrium of floating bodies. Stability of equilibrium and Pressure of gases, problems of relating to atmosphere.

PAPER - II

Section - A : Algebra, Real Analysis, Complex Analysis, Partial differential equations.

Section - B : Mechanics, Hydrodynamics, Numerical Analysis, Statistics including probability. Operational research.

Algebra : Group, Sub-groups, normal sub-groups, homomorphism of groups, quotient groups. Basic isomorphism theorems. Sylow theorems. Permutation Groups. Cayley's theorem. Rings and ideals, Principal ideal domains, unique factorization domains and Euclidean domains. Field Extensions, finite fields.

Real Analysis: Metric spaces, their topology with special reference to R^n,sequence in a metric space Cauchy sequence, Completeness, Completion, Continuous functions, Uniform Continuity. Properties of continuous functions on Compact sets. Riemann Steiltjes' Integral, Improper intergrals and their conditions of existance. Differentiation of functions of several variables. Implicit function theorem, maxima and minima., Absolute and Conditional Convergence of series of real and Complex terms, Rearrangement of series. Uniform convergence infinite products. Continuity, differentiability and integrability for series, Multiple integrals.

Complex Analysis: Analytic functions, cauchy's theorem, Cauchy's integral formula, power series, Taylor's series, Singularities, Cauchy's Residue theorem and Contour integration.

Partial Differential Equations : Formation of partial differential equations, Types of Integrals of Partial differential equations of first order, Charpits methods, Partial differential equation with constant coefficients.

Mechanics : Generalised Co-ordinates, Constraints, holonomic and non-holonomic systems, D'Alembert's principle and Langranges' equations, Moment of Inertia, Motion of rigid bodies in two dimension.

Hydrodynamics: Equation of continuity, momentum and energy, Inviscid Flow Theory: Two dimensional motion, Streaming motion, sources and Sinks.

Numerical Analysis : Transcedental and Polynomial Equations: Methods of solution, bisection, regula-false secant and Newton-Raphson and order of its convergence.

Interpolation and Numerical Differentiation: Polynomial interpolation with equal or unequal step size. Spline interpolation - Gubic Splines. Numerical differentiation formulae with error terms.

Numerical Intergration : Problems of approximate quadrative, quadrature formulae with equispaced arguments, Caussian quadrature Convergence.

Ordinary Differential Equations : Euler's method, multisytep Predector-Corrector Methods - Adam's and Milne's method, Convergence and stability, Runge-Kutta methods. Probability and Statistics.

1. Statistical Methods : Concept of statistical population and random sample. Collection and presentation of date. Measure of location and dispersion. Moment and Shepard's corrections. Comulants. Measures of Skewness of Kurtosis.

   Curve fitting by least squares Regression, correlation and correlation ratio. Rank correlation, partial correlation co-efficient and Multiple correlation co-efficient.

2. Probability : Discrete sample space, Events, their union and intersection etc. Probability - Classical relative frequency and exiomatic approaches, Probability in continnum, Probability space conditional probability and independence, Basic laws of Probability, Probability of combination of events, Bayes theorem, Rondom variable Priobability function, Probability density function, Distribution function, Mathematical expectation, Marginal and conditional distributions, conditional expectation.

3. Probability distributions : Binomial, Poison, Normal, Gamma, Beta, Cauchy, Multinmial, Hypergeometric, Negative Bionomial, Chebychev's lemma (Weak) law of large numbers, Central limit theorem for independent and identical varieties. Standard errors, Sampling distribution of to Fand Chi-square and their uses interests of significance. Large sample tests for mean and proportion.

Operational Research :

Mathematical Programming : Definition and some elementary properties of convex sets, simplex methods, degeneracy, duality and sensitivity analysis, rectangular games and their solutions, Transportation and assignment problems. Kuha Tucker condition for non-linear programming. Bellman's optimality principle and some elementary applications of dynamic programming.

Theory of Queues: Analysis of steady - State and transient solutions for quenqueing system with Fission arrivals and exponential service time.

Deterministic replacement models, Sequencing problems with two machines n jobs, 3 machines, n jobs (Special case) and n machines 2 jobs.

III Subject : Statistics

PAPER-I

I. Probability:

Sample space and events, probability measure and probability space, Statistical Independence, Random variable as a measurable function, Discourteous and continuous random variables, Probability density and distribution functions, marginal and conditional distribution functions of random variables and their distributions, expectations and movements, conditional expectation, correlation coefficient; convergence in probability in LP almost everywhere, Markov, Chebychev and Kolmogrov inequalities, Borel Cantelli Lemma, weak and strong law of large numbers probability generating and characteristic functions. Uniqueness and continuity theorems. Determination of distribution by moments. Liderbery-Devy Central limit theorem. Standard discrete and continuous probability distributions, their interrelations including limiting cases.

II. Statistical Inference :

Properties of estimates, consistency, unbiasedness, efficiency, sufficiency and completeness. Cramer -Rao bond, Minimum variance unbiased estimation, Rao-Blockwell and Lehmann Sheffe's theorem methods of estimation by moments maximum likelihood, minimum Chi-square. Properties of maximum likelihood estimators confidence intervals for parameters of standard distribution.

Simple and composite hypotheses, statistical tests and critical region, two kinds of error, power function unbiased tests, most powerful and uniformly most powerful tests Neyman Person Lemma, optimal tests for simple hypotheses concerning one parameter, monotones likelihood ratio property and its use in constructing UMP tests, likelihood ratio criterion and its asymptotic distribution, Chi-square and Kilmogoro tests for goodness of fit. Run test for randomness Sign test for Location, Wilcoxon Mann-Whitney test and Kologor-Smirnov test for the two sample problem. Distribution free confidence intervals for quantities and confidence band for distribution function.

Notions of a sequential test, Walds SPRT, its Cc and ASN function.

III. Linear Inference and Multivariate Analysis:

Theory of least squares and Analysis of variance, Qauss-Markoff theory, normal equations, least squares estimates and their precision. Tests of significance and Intervals estimates based on least square theory in one way, two way and three way classified date. Regression Analysis, linear regression, estimates and test about correlation and regression, estimates and tests about correlation and regression coefficient curve linear regression and orthogonal polynomials, test for linearity of regression Multivariate normal distribution, multiple regression, Multiple and partial correlation, Mahalanoblis D2 and Hotelling T2-statistics and their applications (derivations of distribution of D2 and T2 excluded) Fisher's discriminant analysis.

PAPER - II

I. Sampling Theory and Design of Experiments.

Nature and scope of Sampling, simple random sampling, sampling from finite populations with and without replacement, estimation of the standard errors sampling with equal probabilities and PPS Sampling. Stratified random and systematic sampling two stage and multistage sampling. Multiphase and cluster sampling schemes.

Estimation of population total and mean, use of biased and unbiased estimates auxiliary variables, double sampling standard errors of estimates cost and variance functions ratio and regression estimates and their relative efficiency. Planning and organization of sample surveys with special reference to recent large scale surveys conducted in India.

Principles of experimental designs, CRD, RED, LSD, missing plot technique factorial experiments 2n and 3n design general theory of total and partial confounding and fractional replication. Analysis of split plot, BIB and simple lattice designs.

II. Engineering Statistics :

Concepts of quality and meaning of control. Different types of control charts like X-R charts, P charts, np charts and cumulative sum control charge.

Sampling inspection Vs 100 percent inspections. Single, double, multiple and sequential sampling plans for attributes inspection, CC, ASM, and ATI, curves, Concept of producer's risk and consumer's risk. AQL, AQQL, LTPD etc. Variable sampling plans.

Definition of Reliability, maintainability and availability. Live distribution failure rate and both-tub, failure curve exponential and Welbull model. Reliability of series and Parallel systems and other simple configurations. Different types of redundancy like hot and cold and use of redundancy In reliability Improvement problem In life testing, censored and truncated experiments for exponential model.

III. Operational Research :

Scope and definition of OR different types of models, their construction and obtaining solution.

Homogenous discrete time Markov chains, transition probability martris, classification of states and ergodic theorems. Homogenous continuous time Markov chains. Elements of queuing theory, M/M/I and M/M/K queues, the problem of machine interference and GI/M/I and M/GI queues.

Concept of Scientific inventory management and analytical structure of inventory problems Simple models with determinist and stochastic demand with and without leadtime. Storage models with particular reference to dam type.

The structure and formation of a Linear programming problem.

The simplex procedure two phase methods and charnes - Method with artifical variables. The quality theory of liner programming and its economic interpretation Sensitivity analysis.

Transportation and Assignment problems.

Replacement of items that fail and those that deteriorate group and individual replacement policies.

Introduction to computers and elements of Fortran IV programming formats for input and output statements specification and logical statements and sub-routines. Application to some simple statistical problems.

IV. Quantitative Economics :

Concept of time series, additive and multiplicative models, resolution into; four components, determination of trend by freehand drawing, moving averages and fitting of mathematical curves, seasonal indices and estimate of the variance of the random components.

Definition, construction, interpretation and limitations of index numbers, Lespeyre Parsche Edgewoth Marshall and Fisher index numbers their comparisons tests for Index numbers and construction of cost of living index.

Theory and analysis of consumer demand - specification and estimation of demand function. Demand elasticities. Theory of production, supply functions and elasticities, input demand functions. Estimation of parameters in single equation model, classical least squares, generalized least squares, heterscedasticity, serial correlation, muticollinearity, errors in variables model, simultaneous equation models-identification, rank and order conditions.

Indirect least squares and two; sage least squares. Short-term economic forecasting.

V. Demography and Psychometry:

Sources of demographic data : census registration : NSS and other demographic surveys. Limitation and uses of demographic data.

Vital rates and ratios : Definition, construction and uses.

Life tables, complete and abridged : construction of life tables from vital statistics and census returns, Uses of life tables.

Logistic and other population growth curves. Measure of fertility, Gross and net reproduction rates.

Stable population theory, Uses of stable and quasistable population techniques in estimation of demographic parameters.

Morbidity and its measurement standard classification by cause of death. Health surveys and use of hospital statistics.

Educational and psychological statistics methods of Standardisation of scales tests, IQ tests, reliability of test and T and Z scores.

IV Subject : Computer Science
Paper I

1.(a)Introduction to Computers – Evolution of Computers, Generation of Computers, Classification of Computers, Analog Digital and Hybrid Computers, Classification of Computers according to size, super Computers, Mainframe Computers, Personal Computers (Different Types) and Terminals (Different Types), Characteristics of Computers, Block Diagram of a Digital Computer.

(b)PROGRAMMING IN C – Overview of C, Constants, Variables and Data types. Operators and expression – Arithmetic operators, Relational operators, Logical operators, Assignment operators, increment and decrement operators, conditional operators, bitwise operators, special operators, some computational problems, type conversion in expressions, operator precedence and associativity, Mathematical functions.

2.(a)Input and Output statements, Decision making, Branching and looping,- Input and output statements, reading a character, writing character, formatted input, formatted output statements, IF statement, simple IF statement, The IF-ELSI statement, nesting of IF..ELSE statement, The ELSE-IF ladder, The switch statement, The ?: operator, the GOTO statement, The WHILE statement, The DO statement, The FOR Statement, jumps in loops.

(b)Arrays, Functions, Structure and union – One dimensional arrays, Two-dimensional arrays, initializing two-dimensional array, Multidimensional arrays, Functions- definitions, Need, Syntax of function declaration, all types of functions, Structure definition, giving values to members, structure initialization, comparison of structure variables, array as structure, array within structure, union pointers – Understanding pointers, accessing the address of variables, declaring and initializing pointers, accessing a variable through its pointer.

3.(a)DBMS – Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, When not to use a DBMS, Database System Concepts and Architecture: Data Models, Schemas, and Instances, DBMS Architecture and data Independence., Database languages and interfaces. The Database system Environment, Classification of Database Management Systems.

(b)Data Modeling Using the Entity-Relationship Model: High level Conceptual Data Models for Database Design with an example., Entity types, Entity sets. Attributes, and Keys, ER Model Concepts, Notation for ER Diagrams, proper naming of Schema Constructs, Relationship types of degree higher than two.

c)Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; UpdateOperations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

d)SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

4.Data Structures – Introduction to data structures – Definition, Classification of data structures. Operations on data structures, Linked Lists – singly Linked Lists, Operations on linked lists, Insertion and deletion of a node, Introduction to circularly linked lists and doubly linked lists.

5.(a)Stacks & Queues – Concepts, Operations, Application of stacks, Queues – Concepts. Operations, sequential and linked implementation, Circular queues, Priority queues, and Dequeues (Introductory concepts). Application of queues.

(b)Trees & Graphs – Definitions and concepts –Binary trees, Sequential and Linked Representation of Binary Tree Trees, Insertion and deletion on binary trees, Binary Tyree Traversal, Graphs –Concepts, Sequential and linked representation of Graphs, BFS and DES Traversal.

Paper II

1.OPERATING SYSTEM – What is an operating system (OS)?, History of OS, Simple Batch Systems, Multiprogrammed Batched Systems, Time-Sharing Systems, Personal Computer systems, Distributed Systems and Real –Time Systems, Operating System Structures – Command Interpreter System, Operating System Service, System Calls. System Programs.

2.(a)Process Management – Process Concept, Process control Block, Process Scheduling, CPU Scheduling –Basis Concepts, Scheduling Algorithms – FIFO, RR, SJF, Multi-level, Multi-level feedback.

(b)Process Synchronization : Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

(c)Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

(d)Secondary Storage Structures, Protection : Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

3.(a)Storage Management – Basis Concepts, Logical and physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Virtual Memory – Demand paging, page Replacement, page Replacement Algorithms, Allocation of Frames, Thrashing and Demands Segmentation.

(b)File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

4.Computer Networks –a)Introduction: Data Communications, Networks, The Internet, Protocols & Standards, Layered Tasks,The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing.

b)Physical Layer-1: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar Ripolar and Manchester coding), Analog-to-digital conversion (only PCM), Transmission Modes, Digital-to-analog conversion.

c)Physical Layer-2 and Switching: Multiplexing, Spread Spectrum, Introduction to switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

5.(a)Data Link Layer-1: Error Detection & Correction: Introduction, Block coding, Linear block codes, Cyclic codes, Checksum.

(b)Data Link Layer-2: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only)