

**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**COMMERCE & BUSINESS MANAGEMENT**  
**SYLLABUS**

**MANAGEMENT OF ORGANISATION THEORY**

**Unit -I: Introduction to Organisation and Management**

Organisation: - Definition and nature of Organisations - Characteristics - Types of organizations: Formal and informal - Management: Definition and Characteristics. Management as an Art. Science and Profession. Concept of efficiency and effectiveness - Functions of Management; Planning Organisation, Staffing, Leading, and Controlling -Approaches: an Overview of Classical. Human Relations and Systems Approaches - Fayol's Principles of Management.

**Unit - II: Planning and Decision Making:**

Types of Plans - MBO - Decision Making: Decision Making Process, Types of Decisions - Decision Making Models: Classical, Administrative and Political - Group Decision Making Techniques: Brain Storming, Delphi, Nominal Group technique, Lotus Blossom Techniques.

**BUSINESS ENVIRONMENT**

**Unit-I: Business and its Environment**

Concept of Business Environment - Characteristics of Business Environment -Significance -Environmental Scanning - Process - Techniques of Environmental Scanning - Practices of Environmental Scanning.

**Unit-II: Economic Environment**

Economic system - Nature, Growth and Role of Public Sector - Privatization - Nature of Objectives - Privatization Routes - Disinvestment - Globalization - Nature and Rationale - Multinational Corporations - India & WTO- Fiscal and Monetary Policy - Foreign Direct Investment - Mergers and Acquisitions - Business Process outsourcing -Competition Policy.

**Unit-III: Political, Social & Cultural Environment**

Political Institutions - Legislature, Executive, Judiciary and Judicial Activism - Culture and Business Ethics - Social Responsibility of Business - Nature, Models and Strategies - Corporate Governance & Corporate Social Responsibility - Social Audit - Ecology and Business - Nature of Physical Environment - Impact on Business.

## **MANAGERIAL ECONOMICS**

### **Unit-I: Introduction**

Nature, Scope and Significance of Managerial Economics Tools and Techniques of Analysis-Theory of Firm - Alternatives - Objectives of Firm - Functions of Managerial Economist.

### **Unit-II: Demand Analysis**

Demand Analysis - Significance - Demand Functions - Law of Demand - Elasticity of Demand -Supply Analysis, Supply function, Elasticity of Supply - Significance of Elasticity Demand in Pricing Decision - Demand Forecasting - Techniques of Demand forecasting. (Simple Problems)

### **Unit-III: Market Analysis**

Structure of Competition - Features of Perfect competition - Types of Imperfect Competition -Features of Monopoly - Negative consequences of Monopoly - Oligopoly Competition -Monopolistic Competition - Price and Output in different competitive situations - Pricing Methods ‘ - Dual Pricing - Administered Price - Subsidies - Trend towards Monopolistic Competition -Emerging scenario of Oligopoly Competition with mergers and Acquisitions in National and International Market ( M & A).

## **ACCOUNTING FOR MANAGERS**

### **Unit-I: Accounting and Economic Decisions**

Processing Transactions - Accounting Cycle - Journal Ledger - Trial Balance -Accounting for Merchandising Transactions - Internal Control Systems relating to Cash and Receivables - Basic Accounting concepts and Conventions.

## **STATISTICS FOR MANAGEMENT**

### **Unit-I: Introduction**

Statistics: Meaning and Salient Features of Statistics - Statistical Techniques - Role of Statistical Techniques in Management Decision Making - Techniques of Business Forecasting: Correlation and Regression Analysis with two variables.

### **Unit-II: Probability and Probability Distributions**

Probability: Concepts of Probability - Additive and Multiplicative Laws- Baye's Decision Rule -Probability Distributions: Binomial, Poisson and Normal distribution.

### **Unit-III: Sampling Theory and Tests of Significance**

Sampling: concept of Sampling - Reasons for Sampling - types of Samples -Estimation - Hypothesis Testing - Types-I and Type-II Errors - Large Sample Tests: Mean Test - Difference between Two Means - Difference between Two Standard Deviations - small sample Tests: Mean Test - Difference between Two Dependent Samples of Paired Observations.

## **BUSINESS RESEARCH METHODS**

### **Unit-I: Introduction**

Business Research: definition - Types of Business Research Scientific Investigation: The Building Blocks of Science in Research - Deduction and Induction. The Language of Research: Concepts. Constructs, Definitions, Variables, Propositions and Hypothesis, Theory and Models. Technology and Business research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in Managerial Decisions Ethics in Business Research: Ethical Treatment of Participants - Informed Consent, Rights to Privacy, Confidentiality.

### **Unit-II: Collection and Analysis of Data**

Sources of Data - Primary source of Data - Secondary source of Data - Data Collection Methods -Interviews: Structured Interviews and Unstructured Interviews - Face to face and Telephone Interviews - Observational Surveys - questionnaire construction: Organizing questions

- Structured and Unstructured Questionnaires - Guidelines for construction of questionnaires. Data Analysis: an overview of Descriptive, Associational and Inferential Statistical Measures.

**Unit-III: The Research Report**

Research Reports - Components - The Title Page - Table of Contents - Executive Summary -The Introductory Section - the Body of the Report - the Final Part of the Report - Acknowledgements - References - Appendix - Guidelines for Preparing a Good Research Report Oral Presentation -Deciding on the Content - Visual Aids - the presenter - The Presentation and Handling Questions.

**Model Question Paper**

Time: 3 Hours

Max. Marks: 100

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**ENGLISH**  
**SYLLABUS**

**Part-I**

**I. Literary Concepts and Research Methodology:**

Parody, Metaphysical Conceits, Syllogisms, Unification of Sensibility, Rise of the English Novel, Theory of Poetic Diction, Fancy and Imagination, Denotation and Connotation, Drawing Room Novel, Victorian Compromise, Problem Play, Oedipus Complex, Psychological Novel, Stream of Consciousness, Archetypes, Socialist Realism, Historiographic Metafiction, Touchstone Method, Hermeneutics, Black Humour, Self-reflexive Novel, Inter-textuality, Signifier and Signified. Competence and Performance, Linguistic Binarism, Synchronic and Diachronic Studies of Language, *Difference*, Grapho-centrism, Vibhava, Anubhava, Chitratruraga Nyaya

Selecting a topic, using library resources, Taking notes, Plagiarism, Works Cited, Bibliography, Language and Style, Mechanics of Writing.

**Part-II**

**I. Literary Essays:**

Literature and Social Change, Science Fiction, Role of the Writer in the Present Age, Literature and Films, Modern Age, Stream of Consciousness, Imagism, Poetry of the Thirties, Movement Poetry, Theatre of the Absurd, Modernism, Symbolism, Post-modernism, Post-Colonialism, Magic Realism, Feminism, Realism, Angry Young Man, Dystopia, Existentialism.

**II. Critical Appreciation of a poem:**

Sethuraman, VS., CT Indra, T. Sriraman, ed. *Practical Criticism*. Madras: Macmillan, 1995 and Verghese, Paul. *Literary Criticism: A Work Book*. Madras: Macmillan India Ltd., 1981.

**III. Literary Criticism:**

Critical Approaches to Literature, Eliot's Theory of Impersonality, IA Richards on Four Kinds of Meaning, New Criticism, Structuralism, Feminism, and Theory of Rasa

**IV. 20<sup>th</sup> Century British Literature:**

**Poetry:** TS Eliot, W. H. Auden, Ted Hughes; **Drama:** Samuel Beckett, Harold Pinter; **Fiction:** James Joyce, Joseph Conrad, William Golding

**V. 20<sup>th</sup> Century Indian English Literature:**

**Fiction:** Mulkraj Anand, Shashi Deshpande, Salman Rushdie; **Poetry:** A. K. Ramanujan, Kamala Das, Nissim Ezekiel; **Drama:** Girish Karnad

**VI. English Language Teaching:**

Methods of Teaching English: Direct, Bi-lingual, Grammar-Translation Methods, Approaches to Material Production: Structural, Situational and Communicative Approaches; Teaching of Prose/ Poetry/Grammar and Composition, Error Analysis, Testing and Evaluation, Theories of Language Learning, Varieties of English: American, British, and Indian.

**VII. Post-Colonial Literatures:**

**Poetry:** Margaret Atwood, Derek Walcott; **Fiction:** Chinua Achebe, 'Ngũgĩ wa Thiong'o, Toni Morrison; **Drama:** Wole Soyinka.

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<b>NOTE: ENTRANCE TEST WILL BE IN DESCRIPTIVE PATTERN</b>
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**EDUCATION  
SYLLABUS**

**PAPER-I**

**PHILOSOPHICAL AND SOCIOLOGICAL FOUNDATIONS OF EDUCATION  
(2 Short questions and 2 Essay questions)**

- Unit-I:**
- i) Philosophy of Education: its nature - Philosophical Enquiry, Relationship between Philosophy and Education
  - ii) Philosophy and its Functions - Speculative, Normative, Analytical
- Unit-II:**
- i) Eastern and Western Schools of Philosophy (Eastern - Sankya, Yoga, Nyaya; Western -Idealism, Naturalism, Realism & Pragmatism) - Their Contributions to Metaphysical, Epistemological, Ethical, Axiological and Social Aspects and their Educational Implications
- Unit-III:**
- i) Contribution of Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhi, Sri Aurobindo and J. Krishnamurti to Educational Thinking. National Values as Enshrined in the Indian Constitution, and Their Educational Implications.
- Unit-IV:**
- i) Concept and nature of Sociology of Education, Social Mobility, Social Groups; Social Stratification, Factors Influencing Social Tensions - Peace Education.
- Unit-V:**
- i) Culture-Meaning and Mature of Culture, Role of Education in Cultural Context; Education and Cultural Change.
  - ii) Meaning and Nature of Social Change,
  - iii) iii) Education and Modernization, Education and Religion.
  - iv) Education and Democracy; Constitutional Provisions for Education; Nationalism and Education; Education for National Integration and International Understanding.
  - v) Equality of Educational Opportunity and Excellence in Education - Equality vs. Equity in Education; Inequalities in Indian Social System with Special Reference to Socially Disadvantaged Groups.

**PAPER-II**

**ADVANCED EDUCATIONAL PSYCHOLOGY  
(2 Short questions and 1 Essay question)**

- Unit-I :** Scope of Educational Psychology from the Application Point of View - Contribution of Psychology to Education.
- Unit-II :** Growth and Development Principles and Aspects of Personality Development
- i) Psycho-Analytic Theory of Sigmund Freud,
  - ii) Cognitive Development - Theory of Jean Piaget.
  - iii) Moral Development - Theory of Kohlberg.
  - iv) Social Development - Theory of Bandura.
- Unit-III:** Learning
- i) Learning and Motivation - Moslow's Theory
  - ii) Conditioning Theory - Pavlov; Skinner
  - iii) Reinforcement Theory - Thorndike
  - iv) The Structure of Learning, Constraints of Learning, Factors influencing learning.
- Unit-IV:** Intelligence and Creativity
- i) Structure of Intellect Model - Guilford Development of Intelligence.
  - ii) Creativity - Nature, Process, Identification, Fostering and Guiding Creative Children, and Measurement of Creativity - Verbal & Non-Verbal; Assessing Creativity - Torrance Passi, Baqer Mehdi.
- Unit-V:** Special Education for the Exceptional Children: Gifted – Educationally Backward Children - Group Dynamics with Special Reference to Special Children.

### **PAPER-III**

#### **(a): METHODOLOGY OF EDUCATIONAL RESEARCH (2 Short questions and 1 Essay question)**

- Unit-I:** Educational Research and Theory Development
- i) Meaning and Nature of the Research - Need and Purpose of Educational Research -Problems of Educational Research in India - Some special areas of Educational Research - Philosophical, Psychological and Sociological orientation - Knowledge and research -Scientific inquiry and theory development
  - ii) Qualitative and Quantitative research in education - Assessment and evaluative research - Fundamental (Basic) research, Applied research and Action research.
  - iii) Paradigms and Theory, Model and Approach; Positivist and Non-Positivist (Humanities) Paradigms and their Implications for Educational Research - Fact and Theory, Constructing a Theory, Relationship Between Theory and Research -Interdisciplinary Approach in Education Research.



- Unit-II:** Literature survey and Preparation of Research Proposal or Synopsis
- i) Literature Survey: Objectives and Purpose of Survey of Literature, Sources of Review of Literature, Consolidations Drawing Conclusions Leading to Framing Research Questions and Hypotheses - Delineating and Operationalizing Variables - Formulating Objectives or Research Questions
  - ii) The Hypotheses and Forms of Hypotheses: Directional and Non-Directional Hypotheses - Testing Hypotheses.
  - iii) Preparation of Research Proposal: Selection or Identifying the Research Problem (or topic) - Sources of Information for the Problem - Preparation of a Research Proposals or Synopsis to Different Academic Purposes and to a Funding Agencies.
- Unit-III:** Data Collection Procedures and Techniques in Educational Research
- i) Sampling Techniques: Concept of Population and Sample, Various Methods of Sampling, (a) Non-Probability Sampling Techniques (b) Probability Sampling Techniques, and Determination of Sample Size, Sampling Errors and How to Reduce Them.
  - ii) Tools and Techniques of Data Collection: Concept, Characteristics, Construction, Analysis and Interpretation, Advantages and Limitations of (a) Questionnaire, Schedule and Checklist (b) Interview (c) Observation (d) Tests: Psychological Tests- Intelligence, Creativity, Personality, Achievement, and Aptitude Tests (e) Scales: Rating and Attitude Scales, (f) Interest Inventories (g) Projective and Socio-Metric Techniques.
  - iii) Test Construction: Steps of Test Standardization, Strengths and Weakness of Tests -Reliability and Methods of Computing Reliability Coefficient - Validity and Methods of Establishing Validity - Interpretation of Validity and Reliability Coefficients.
- Unit-IV:** Methods of Educational Research
- i) Nature, Scope, Uses and Limitations of the following methods: (a) Historical Research (b) Normative Survey (c) Experimental Research (d) Causal- Comparative (Ex-Post Facto Research or Explanatory), Laboratory Experiment, Field Experiment and Field Studies (e) Correlation Studies (f) Case Study and Genetic Methods (g) Developmental Studies (h) Documentary or Content Analysis (i) Ethnographic Studies.
- Unit-V:** Writing up Research Report
- i) Types of Research Reports - General Format of the Research Report: Preliminary Section, Main Body of the Report and Reference Section - Style, Format of Writing and Typing of the Different Sections of Research Report - Precautions in Report Writing and Characteristics of a Good Report - Evaluation of the Report.

**PAPER-III**  
**(b): EDUCATIONAL STATISTICS**  
**(2 Short questions and 1 Essay question)**

- Unit-I:** Data analysis and interpretations
- i) The Importance of Statistics in Education, Nature of the Data in Qualitative and Quantitative Data Analysis
  - ii) Qualitative Data Analysis of Interview and Observation Based Data - Coding Procedures, Scoring Procedures, Tabulation, Interpretation of Data, Conclusions and Generalizations,
  - iii) Quantitative Data Analysis - Scales of Measurements: Nominal, Ordinal, and Internal & Ratio.
- Unit-II:** Organization and Graphic Representation of Data
- i) Frequency distribution, Frequency Polygon, Smoothed Frequency Polygon, Flistogram, Cumulative Frequency Curve, Cumulative Percentage Curve (or Ogive)
  - ii) Concepts, Calculations and Uses of (a) Measures of Central tendencies (b) Measures of Variability (c) Percentiles and Percentile Ranks,
  - iii) Properties and applications of Normal Probability Curve, Measuring Divergence from Formality - Skewness and Kurtosis
- Unit-III:** Measures of Relationships
- i) Correlations, Regression Equations and Predication
  - ii) Further Correlations - Biserial, Point-Biserial, Tetrachoric and Phi-Coefficient of Correlation, Partial and Multiple Correlations.
- Unit-IV:** Inferential Statistics - Parametric Tests
- i) Standard Error of Mean, Confidence Limits, Degrees of Freedom, Levels of Significance ii) Type One Error & Type Two Errors, One-Tailed & Two-Tailed Tests iii) Significance of the Difference Between Means - the T-test iv) Analysis of Variance (ANOVA) (One-way) - the F-test.
- Unit-V:** Inferential Statistics - Non-Parametric tests
- Chi-Square ( $\chi^2$ ) - Equal Probability, Normally Distribution, Independence in Contingency Tables, 2x2 Fold Contingency Tables.

**PAPER-IV**  
**CURRICULUM DEVELOPMENT AND EDUCATIONAL TECHNOLOGY**  
**(2 Short questions and 1 Essay question)**

- Unit-I:** Introduction to Curriculum Development
- i) Concept and Meaning of Curriculum - Origin and Evolution of Curriculum making Eastern and Western - History of Curriculum

Development in India - Determinants of Curriculum: Philosophical, Sociological, Psychological and Historical.

- Unit-II :** Curriculum Organization
- i) Curriculum Design and Organization - Components and Source of Design - Curriculum Construction - Different Models and Principles - Logical and Psychological Approaches: Topical, Unitary and Spiral Organization - Core Curriculum.
- Unit-III:** Programmed Instruction and Systems Approach
- i) Programmed Instruction: Development of Programmed Instruction Material -Linear/ Branching Model, Recent Innovations in Programme Formats - Skip Linear Programmes - Computer Assisted Instruction - Systems Approach in Educational Technology - Multi-Media and Multi-Media Approach in Educational Technology
- Unit-IV:** I.C.T. and Education
- i) Communication Process: Concept of Communication - Principles, Modes and Barriers of Communication; Classroom Communication (Interaction Verbal and non-Verbal) -Mass Media approach in Educational Technology - ICT in Education - Online/Offline Learning Resources - Computer based Teaching and Computer Assisted Learning - Recent Trends in Educational Technology
- Unit-V :** Curriculum Evaluation
- i) Importance of Evaluation of Curriculum - Models of Curriculum Evaluation

**PAPER-V**  
**TEACHER EDUCATION**  
**(2 Short questions and 1 Essay question)**

- Unit-I :** Teacher Education - Concepts, Aims and Scope of Teacher Education - Teacher Education in a Changing Society - A Brief Review of the Development Teacher Education in India -Ancient, Medieval, British and Post-independent Period - National Policy on Education in Relation to Teacher Education - Recommendations of Different Commissions and Committees in the Post-independent Era on Teacher Education.
- Unit-II :** Teacher Education Curriculum at Different Stages - Pre-primary, Primary, Secondary, Higher Secondary - Teachers for Special Education.
- Unit-III:** Principles of Teaching: Methods of Teaching School Subjects - Teaching Models -Concept Attainment Model - Inquiry Training

Model, Problem Solving Model and Inductive Thinking Model -  
 Student Teaching: Role of Student Teaching in Teacher Education  
 Programme -Organization of Student Teaching: Various Patterns -  
 Micro Teaching, Block Teaching, Internship - Its Organization and  
 Problems - Supervision and Evaluation of Student Teaching.

**Unit-IV :** Teaching as a Profession: Meaning of Profession - Professional Ethics -  
 Role of Professional Organization of Teachers - Faculty Improvement  
 Programmes for Teacher Education - In-service Teacher Education and  
 the Role of Distance Education Institutions / Open Universities.

**Unit-V :** Major issues in Teacher Education: Quality of Teacher Education -  
 Role of NCTE -Competency based Commitment Oriented Quality  
 Education - Accreditation and Accountability in Teacher Education -  
 Concept of Effective Teaching and Characteristics of a Good Teacher -  
 Research in Teacher Education: Action Research.

### Model Question Paper

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**PHYSICAL EDUCATION**  
**SYLLABUS**

**Unit -1: Sports Bio-mechanics**

Meaning, Scope, Need for Bio-Mechanics in sports- Equilibrium, Motion, Force, Levers, Impact and Elasticity, Friction, Kinetic Energy and Potential Energy - Application of Mechanical principles to various techniques in sports

**Exercise Physiology**

Skeletal Muscles - Structure and Function - Cardio respiratory and Aerobic power - Neuro-Muscular junction and coordination of muscular activity - Physiological aspect of Exercise and Sports, Altitude and temperature regulation.

**Unit -II: Sports Psychology**

Meaning, Definitions scope, need and development of Psychology in sports - personality -types of personality - well built sports personality - Emotional states Psychological variables aggression - motivation - Anxiety, Arousal and activation and stress - Reasons for emotions and control of emotions in sports.

**Applied Kinesiology**

Introduction to Kinesiology - History and Development of Kinesiology - Application to sports - Axis and planes - Types of muscles Muscular attachments and action - Origin, Insertion, Actions and leverage of major muscle groups.

**Unit -III: Research methodology in Physical Education**

Research - Meaning, Definition and Classification: Need and importance - Research problem - Location and criteria in selection the problem - Research proposal - Formulation of Hypothesis - review of related literature, methods of research - Historical method -Experimental Design, sampling theory - methods of sampling - research report - Mechanics of writing the research report.

**Statistics in Physical Education**

Meaning and Basic concepts of statistics - measures of central tendency and measures of variability - Normal curve and Elementary Graphical methods. Correlation, Reliability and Tests of significance.

**Tests, Measurement and Evaluation in Physical Education**

Measurement and Evaluation - meaning, Need, Objectives selection and construction of tests - measurement of Strength Physical Fitness and Organic functions - Motor ability and Motor Educability and Postural Test - skill tests of various Games.

**Unit IV: Supervision and Curriculum Design in Physical Education**

Supervision - Techniques of supervision and qualities of supervisor - Curriculum Planning -Curriculum Design - Basic principles of curriculum development in Physical Education.

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**BIOTECHNOLOGY**  
**SYLLABUS**

**Unit-I: Cell and Tissue Culture & Genetic Engineering**

1. Introduction to Plant Tissue Culture, -Micropropagation and production of virus free plants
2. Cytodifferentiation *in vitro* and the role of growth regulators in differentiation
3. Somatic Embryogenesis and gene expression
4. Somatic hybridization and
5. Production of Androgenic haploids and their role in crop improvement
6. Cell suspension cultures, Production of Secondary metabolites and biotransformation.
7. Cryopreservation and conservation of Germplasm
8. Animal Cell Culture: Cell culture media, culture procedures in preparation of animal cell cultures, primary culture, cell lines
9. Measurement of cell death and apoptosis
10. Stem cell technology: stem cell culture and transplantation and applications

**Unit-II: Genetic Engineering**

1. Recombinant-DNA technology: The role of Restriction endonucleases in R-DNA technology, different types of Cloning vectors and cloning strategies.
2. C-DNA synthesis and Construction of Genomic libraries
3. Different strategies for sequencing genome
4. Blotting techniques: Southern, Western and Northern blotting techniques.
5. Molecular markers: RFLP, RAPD, AFLP, SSR and their applications.
6. PCR Technology and its applications
7. DNA finger printing and its role in forensic science
8. Gene Transformation Methods: *Agrobacterium* mediated transformation, electroporation, micro-injection and particle bombardment and selection of transformants and regeneration of transgenic plants.
9. Gene silencing and RNA/ technology and ribozymes and application of ribozyme technology

**Unit-III: Microbial, Environmental and Advanced Biotechnology**

1. An overview of fermentation technology, range of fermentation processes components of fermentation process and various types of fermentations.
2. Biomonitoring of Environment - biological indicators, biosensors, genosensors and Waste water treatment through aerobic and anaerobic microorganisms, pollution control biotechnology
3. Microbial degradation of pesticides, Microbial leaching and biomim'ng and Microbial degradation of lignocelluloses, biofuels.
4. Molecular aspects of biotic and abiotic stress responses and genetic engineering for Insect, Fungal, drought, salinity and Temperature resistance.
5. Plastid transformation-Chloroplast genetic system, plastome engineering in higher plants & advantages.
6. GM Crops, Molecular Pharming, Plantibodies and plants as bioreactors
7. Regulatory mechanisms in releasing GMOs. IPRs. Plant breeders rights and Biosafety regulations.
8. Various Methods of gene therapy,
9. Pharmacokinetics: drug delivery & designs
10. Mass production of bioactive substances: interferon, interleukins.

#### **Unit-IV: Biomolecules, Cell Biology and Genetics**

1. Hydrodynamic properties of biomolecules,
2. Structure Classification and properties of carbohydrates: mono, di and poly Saccharides
3. Structure Classification and properties of Lipids and Amino acids,
4. Structure, Classification and properties of Proteins, glycoproteins and lipoproteins
5. Structure of Nucleic Acids, different forms of DNA and RNA. Three dimensional structure of RNA, Cot curves, chemical synthesis of DNA
6. Organization of eukaryotic chromosome: structure of nucleosome and extent of chromatin and Special Type of Chromosomes
7. Cell cycle - Overview of eukaryotic cell cycle and cell death
8. Genetics: Mendel's principles, Multiple alleles, multiple factor inheritance, extra chromosomal inheritance, Linkage and crossing over
9. Phages Genetics: Gene fine structure, concepts of cistron, muton & recon, r II locus
10. Mutations: Chromosome variations in number and structure, Role of mutations in crop improvement and Molecular mechanisms of mutations, Ames test for mutagenesis, DNA damage and repair

#### **Unit-V : Biodiversity & Biophysical techniques**



1. History, general properties and structure of bacteria, fungi and viruses
2. Biodiversity: Definition, levels, organization, uses, and valuing biodiversity, Biodiversity vs. Biotechnology and Biodiversity for Sustainable Development
3. Microbial Diversity: Bacteria, Archaea and their broad classification: Eukaryotic microbes, Yeast, Fungi, moulds and Protozoa; Viruses and their diversity.
4. Animal Diversity: IUCN categories. Rare and endangered categories and extinct animals of India and different methods of Biodiversity Conservation
5. Different types of Centrifugation Methods: differential centrifugation, Density-gradient, analytical ultracentrifugation
6. Chromatography Methods: Paper chromatography, adsorption chromatography (thin-layer chromatography), gas-liquid chromatography and HPLC
7. Electrophoretic Methods: PAGE-Native-PAGE, SDS-PAGE, 2D electrophoresis and PFGE
8. Spectroscopy: Beer-Lambert law, absorbance, transmittance, extinction, coefficient, light sources, monochromatic, type of detection, UV, visible spectrophotometer, infra red spectroscopy. Raman spectroscopy, mass ESR and NMR spectrometry.

#### **Unit-VI: Biochemistry & Immunology**

1. Definitions and nomenclature of Enzymes, Enzymes kinetics and Mechanisms of enzyme action
2. Coupled reactions and oxidative phosphorylations, group transfer, biological energy transducers, bioenergetics. Glycolysis and TCA cycle, HMP shunt, Gluconeogenesis, Energy derivations in fermentation, aerobic and anaerobic respirations.
3. Glyoxylate cycle, Components and organization of mitochondrial electron transport system
4. Photosynthetic pigments and photosynthesis in bacteria and higher plants. Cyclic and non-cyclic photophosphorylation, Mechanism of photophosphorylation.
5. Pathways of CO<sub>2</sub> fixation by C<sub>3</sub>, C<sub>4</sub>. And CAM pathways.
6. Nitrogen fixation: Organization, regulation and expression of Nif genes,
7. Cells of the immune system - B cells, T cells, phagocytes, inflammatory cells, antigen presenting cells.
8. Antigens - nature, types, factors influencing antigenicity and Antibodies - structure, types, classes and functions
9. Antigen- antibody interactions, Agglutination reactions
10. Vaccines: Types of vaccines and component vaccines
11. Hybridoma technology

#### **Unit-VII: Molecular Biology, Bioinformatics & Biostatistics**

1. DNA Replication and repair: Modes of replication, Replication fork. Enzymes and proteins involved in replication.
2. Transcription: RNA polymerases, Promoters and their characterization. Enhancer sequences. Initiation, elongation and termination of RNA synthesis and Posttranscriptional modifications
3. Translation: General features of genetic code, Mechanism of initiation, elongation and termination of protein synthesis
4. Regulation of gene expression: House-keeping genes, constitutive genes, and regulatory genes, Negative regulation and positive regulation. Fine structure of lac operon and Transcriptional control by attenuation in trp operon
3. Introduction to Computers and Overview of computer organization
6. Biological databases: DNA databases, protein-sequencing databases, functional motifs databases, protein-structure databases.
7. Comparative-sequence analysis: Pair-wise sequence alignment, multiple-sequence alignments
8. Proteomics and Genomic studies, Microarray technology and human genome project and applications
9. Introduction to biostatistics: mean, median, mode, frequency distribution, frequency curve, frequency polygon and histogram.
10. Test of hypotheses: Students t-test,  $X^2$  distribution (Chi square), correlation coefficient and analysis of variance (ANOVA).

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**CHEMISTRY**  
**SYLLABUS**

**UNIT-I: INORGANIC CHEMISTRY**

**Bonding theories of metal complexes:** Crystal field theory: Salient features, Splitting of metal orbitals in regular and distorted octahedral, square planar, tetrahedral, square pyramidal and trigonal bipyramidal geometries. Measurement of crystal field splitting energy, High spin and low spin octahedral complexes. Crystal field stabilization energy. Factors affecting the magnitude of crystal field splitting. Jahn-Teller distortion. Applications and limitations of crystal field theory. Molecular orbital theory: Nephelauxetic effect. Molecular orbital diagrams of octahedral, tetrahedral and square planar complexes. Molecular orbital treatment of *Jt bonding* in complexes.

**Magnetochemistry of metal complexes:** Types of magnetism: para, dia, ferro and antiferro-magnetism. Temperature independent paramagnetism. Behaviour of para, dia, ferro and antiferro-magnetic substances with temperature. Magnetic susceptibility measurement: Gouy method and Faraday method. Magnetic properties of metal ions- spin moment and orbital moment. Orbital contribution to magnetic moment. Spin orbit coupling. Quenching of orbital angular momentum by ligand fields. Magnetic properties of complexes with A, E and T ground terms. Anomalous magnetic moments. Spin-free and spin-paired equilibria.

**Reaction mechanisms of metal complexes:** Reactivity of metal complexes: inert and labile complexes. Concept of lability and inertness of complexes in terms of Valence bond and crystal field theories. Nucleophilic substitution reaction of octahedral complexes: Dissociative (SN1) and associative (SN2) mechanism. Acid hydrolysis, factors affecting acid hydrolysis. Base hydrolysis, Conjugate base (CB) mechanism. Evidences in favour of conjugate base mechanism. Reaction without the breakage of metal-ligand bond. Nucleophilic substitution reactions of square planar complexes. Mechanisms of substitution in square planar metal complexes, Trans effect, theories of Trans effect, polarization theory and *Jl* -bonding theory. Applications of trans-effect. Electron transfer reactions: Inner sphere and outer sphere mechanisms. Cross reactions and Marcus-Hush theory.

**Metal-ligand equilibria in solution:** Stability of binary metal complexes-thermodynamic stability and kinetic stability. Concentration, thermodynamic and conditional constants, Stepwise stability constants. Trends in stepwise stability constants. Factors influencing the stability of metal complexes with reference to metal and the ligand. Chelate effect and its thermodynamic origin. Macrocyclic

effect of crown ethers and cryptates. HSAB rule and its application to stability of complexes and metal-ligand interactions in the biological systems. Determination of stability constants of metal complexes. Spectra-photometric and potentiometric methods.

**Organometallic Compounds:** Classification and nomenclature of organometallic compounds; Principles of synthesis of organometallic compounds. Synthesis, structure and properties of organometallic compounds of Al & Sn. **18-Electron** rule and stability of organotransition metal compounds. Synthesis, structure and bonding of olefin, allyl and cyclopentadienyl organometallic compounds of Fe, Pd and Pt. Applications of organometallic compounds of B and Si in organic synthesis. Organometallic compounds in homogeneous catalysis-Hydrogenation, Hydroformylation and Isomerization processes.

**Bioinorganic Chemistry: Metal ions in biological systems:** Brief survey of metal ions in biological systems. Basic principles underlying biological selection of elements. Effect of metal ion concentration and physiological effects. **Oxygen transport and storage:** Hemoglobin and myoglobin- Geometric, electronic and magnetic aspects of dioxygen binding, oxygen adsorption isotherms and cooperativity, physiological significance of hemoglobin. Role of globin chain in hemoglobin. **Metals in medicine:** Introduction, Metals used for diagnosis, Radiodiagnosis, Magnetic resonance imaging. Metals used for therapy-Lithium, gold and Platinum. Chelate therapy.

**Chromatography methods:** General discussion, Adsorption and Partition chromatography, Principles and Applications of paper chromatography, Thin layer chromatography, Gas chromatography - Applications and Instrumentation: detectors used in GC - thermal conductivity detectors, flame ionization detectors, N-P, photoionization detectors; HPLC - Applications and Instrumentation: Refractometric, Fluorescence, Diode array detectors; GC-MS and LC-MS: techniques and applications

**Thermal Analysis:** Principles, Instrumentation, Comparison and interpretation of TGA and DTG curves, TGA curves of mixtures, Factors affecting TGA curves. Applications of TGA. Differential Thermal Analysis and Differential Scanning Calorimetry - Principles, Instrumentation, and quantitative aspects of DTA and DSC curves, Interpretation of DTA and DSC curves. Influence of atmosphere on DTA curves of a sample, Complementary nature of TGA and DTA. Applications of DTA and DSC.

## Unit-II: ORGANIC CHEMISTRY

**Heterocyclic Chemistry:** Classification of the heterocycles based on the nature of the hetero atom and size of the ring: *jc* -excessive and *7I* -deficient heterocycles - Synthesis, properties and comparative study and reactivities of

furan, pyrrole and thiophene: Synthesis and reactivity of indole, pyridine, quinoline, isoquinoline coumarin, pyrazoles, imidazoles, isoxazoles, pyrimidines.

**Reaction Mechanisms** : Investigation of reaction mechanisms: kinetics, isotopes, study of intermediates and product analyses - study of reaction intermediates: formation and stability of carbonium ions, carbanions, carbenes, nitrenes, free radicals and arynes; mechanism in aromatic nucleophilic substitutions:  $S_NAr$ , Benzyne mechanisms-elimination reactions: various types of eliminations and their mechanistic pathways, orientation in eliminations, elimination vs substitution - study of nucleophilic substitutions with specific reference to the neighboring group participation (through  $\pi$ - and  $\sigma$ -bonds); Factors effecting the reactivity and mechanism of nucleophilic substitutions (substrate structure, nature of the leaving group and attacking nucleophile etc.) Selective organic name reactions: Mannich reaction, Michael addition, Tschitchibabin reaction, Shapiro reaction, Barton reaction. Rearrangement reactions: Hoffmann, Curtius, Favorski, Bayer-Villiger, Beckmann, Fries, Benzidine. Benzil-Benzilic acid and Dienone-Phenol rearrangements. Von Richter rearrangement -Hoffman, Loftier, Freytag reaction - Robinson's annulations - Knoevenagel condensation, The Darzens condensation.

**SYNTHETIC ORGANIC CHEMISTRY:** Formation of -C-C- and -C=C- bonds  $\therefore$  C (single) bonds : Alkylation - Importance of enolate anions - Alkylation of relatively acidic methylene group, Alkylation of ketones - The enamine reaction lithium di-alkyl cuprates (Gilman's reagent) - Synthetic applications of carbenes and carbenoids.

C=C (double) bonds: Beta elimination reactions - Pyrolytic synthesis, eliminations - Wittig and related reactions - Peterson olefination - Stereoselective synthesis of tri and tetra substituted ethylenes - oxidative decarboxylation of carboxylic acids.

**Oxidations and reductions:** Oxidations: Oxidation of C=C with transition metal oxidants -  $KMnO_4$  and  $OsO_4$ , stereochemistry of perhydroxylation. Epoxidation and subsequent transformation of epoxides - Reaction of alkenes with singlet oxygen - Cleavage of glycols [ $HIO_4$  and  $Pb(OAc)_4$ ] - Allylic oxidation with transition metal oxidants. Reductions: Group III - hydride transfer reagents to reduce carbonyl groups and other functional groups ( $NaBH_4$  and  $LiAlH_4$ ) - stereochemistry of hydride reductions (Cyclohexanone) - Group IV hydride donors - dissolving metal reductions - addition of hydrogen - reductive removal of functional groups - Reductive C-C (single) bond and C=C (double) bond formation.

**Reagents in organic synthesis:** Use of the following reagents in organic synthesis and functional group transformations: Phase transfer catalysts: tetra alkyl ammonium halides and crown ethers, Woodward-Prevost hydroxylation. 1,3-dithianes (Reactivity and umpolung effect), lithium diisopropyl amide (LDA), dicyclohexyl carbodiimide (DCC), trimethyl silyl iodide, tri-n-butyltin hydride,

dichloro dicyano benzoquinone (DDQ), selenium dioxide, Wilkinson's catalyst and Baker's Yeast, Merrifield resins

**Synthetic Methodology:** Introduction - Target selection, retro synthesis - The disconnection approach with suitable examples (simple molecules) - Functional group inter conversions (FGI), disconnection product - Disconnection and synthon - Synthetic equivalents strategic bond approach - Chemo selectivity, regio selectivity and stereo selectivity with examples - Linear and convergent synthesis.

**Stereochemistry:** Molecular symmetry in organic molecules: Symmetry elements ( $C_n$ ,  $C$ , &  $S_n$ ) and symmetry operations - Configuration — R, S nomenclature; E, Z nomenclature for unsaturated systems, Re and Si faces, prochirality — Racemization and racemic modifications — Resolution of racemic modifications — Principles of chemical reactivity: Kinetic control and thermodynamic control — Partial and absolute asymmetric syntheses — Introduction to stereo-selective syntheses — Stereochemistry of nitrogen compounds with a tetra co-ordinate chiral centre — Stereochemistry of the compounds containing —  $C=N$ - and — $N=N$ -; Concept of dynamic enantiomerism and Atrop-isomerism — Conformational analyses of mono and di substituted cyclohexanes.

### Unit-III: PHYSICAL CHEMISTRY

**Thermodynamics:** Concept of standard states - standard entropy - entropy changes in chemical reactions-entropy of mixing, standard entropies of ions. Third law of thermodynamics - calculation of absolute entropies of solids, liquids and gases - tests and exceptions - Gibbs's and Helmholtz free energy, standard free energy of formation- Variation of free energy with temperature and pressure - free energy change in phase transformations Clapeyron and Clausius-Clapeyron equation - Maxwell's relationships and thermodynamic equation of state. - Non-ideal systems: Fugacity of a gas, determination (general and graphical methods). Activity and activity coefficients of electrolyte solutions - Determination using Debye-Huckel equation and emf method - van Hoff's reaction isotherm. Non-ideal mixtures: Concept of partial molar properties-partial molar free energy-chemical potential. Gibbs-Darhem equation-variation of chemical potential with temperature and pressure- determination of partial molar properties (direct method, method of intercepts and general method). Mixing properties - excess functions and their significance.

**Electrochemistry: Conductance:** Conductance of strong electrolytes - interionic attraction theory -Thickness of ionic atmosphere (no derivation). Debye Huckel Onsager treatment and derivation of conductance equation - tests and deviations - ion association - ion pair formation-association constant - conductance minima and triple ions.

**Electrochemical cells:** Reversible and irreversible cells - Nernst equation of cell emf (thermodynamic formulation) - relation to equilibrium constant of cell

reaction and other thermodynamic parameters. Chemical cells and Concentration cells with and without transference; Liquid junction potential and its determination; Applications of emf measurements. Determination of pH, pKa and K<sub>sp</sub>-potentiometric titrations (acid-base, redox and precipitation). Polarization: Electrode polarization and concentration polarization-Decomposition potential and over voltage-theories of over voltage-factors influencing over voltage.

**Kinetics:** Simultaneous reactions: Derivation of first order rate expression for parallel, opposing and consecutive reactions. Theory of absolute reaction rates-application to reactions between atoms and molecules-Thermodynamic formulation of reaction rates-Calculation of activation parameters. Lindemann's theory of unimolecular reactions and Hinshelwood modification-Effect of Solvent and Ionic strength on rates of ion-ion and ion dipole reactions-Isotopic effect on reaction rates-substrate and solvent isotopic effect, Termolecular reactions: Reactions of nitric oxide with hydrogen, oxygen and halogens.

Kinetics of fast reactions: Flow methods-Stopped flow and continuous flow methods- Relaxation methods-Relaxation time and its relation to rate constant-Temperature jump and pressure jump methods-Flash photolysis. Effect of substituent on the rate of reaction - Hammett's and Taft's equations- use of  $\rho$  and  $\sigma$  constants and extended Hammett equation. Yukawa-Tsuno equation-Nonlinear Hammett plots- Isokinetic temperature and its determination. Homogeneous acid-base catalysis-mechanism of acid-base catalysis-protolytic and prototropic mechanism.

**Quantum Chemistry :** Planck's quantum theory and derivation of Planck's temperature radiation law-Derivation of time independent Schrodinger wave equation-wave function and significance of 'P' and 'F2'-Normalization and orthogonality of wave function-well behaved functions-Operators like momentum (p), angular momentum (L), Energy (E), Hamiltonian (H) and Hermitian-Properties of Hermitian operator-Operator algebra-Postulates of quantum mechanics. **Applications:** Application of Schrodinger wave equation to particle in a one dimensional box and three dimensional box-degenerate states-quantum mechanical tunnelling (qualitative treatment). Rigid rotator: Application of Schrodinger equation to rigid rotator- derivation of energy expression and wave function of a rigid rotator-solution of ( $\psi$ ) and ( $\phi$ ) parts of wave functions-total wave function of rigid rotator.

**Hydrogen atom:** Separation of (r), ( $\theta$ ) and ( $\phi$ ) equations - Solution of radial equation-Total wave function for hydrogen atom-radial and angular plots-probability functions and radial probability density plots for 1s and 2s orbitals.

**Photochemistry:** Photophysical processes - Radiationless processes (Vibrational relaxation, internal conversion, intersystem crossing) and their rate constants-Radiative processes - fluorescence emission, phosphorescence emission. Kinetics of photophysical unimolecular processes. Delayed fluorescence. Quantum yield and its determination, fluorimetry, phosphorimetry. Bimolecular processes -

quenching - Stern -Volmer relationship derivation and deviations. Photochemical processes- Unimolecular processes. Isomerisations and rearrangements (Photochromism), Photoreduction # (hydrogen abstraction by carbonyl group) Norrish Type I and II processes.

#### Unit IV- SPECTROSCOPY

**Microwave Spectroscopy:** Classification of molecules based on moment of inertia. Diatomic molecule as rigid rotator and its rotational energy levels. Selection rules (derivation not required). Calculation of bondlengths from rotational spectra of diatomic molecules. Isotope effect on rotational spectra. Calculation of atomic mass from rotational spectra.

**Vibrational Spectroscopy:** Vibrational energy levels of diatomic molecules, selection rules. Calculation of force constant from vibrational frequency. Anharmonic nature of vibrations. Fundamental bands, overtones and hot bands, Fermi Resonance. Vibration-rotation spectra of diatomic molecules. Vibrations of poly atomic molecules. Normal modes of vibration, concept of group frequencies. Characteristics of vibrational frequencies of functional groups; Stereochemical effects on the absorption pattern in carbonyl group, cis-trans isomerism and hydrogen bonding.

**Raman Spectroscopy** - Quantum theory of Raman Effect, Vibrational Raman spectra, Stokes and anti- Stokes lines. Complementary nature of IR and Raman spectra.

**Electronic Spectroscopy:** Elementary energy levels of molecules-selection rules for electronic spectra; types of electronic transitions in molecules. Chromophores: Congugated dienes, trienes and polyenes, unsaturated carbonyl compounds, benzene and its derivatives, Woodward-Fieser rules. Polynuclear aromatic hydrocarbons and diketones. Solvent and structural influences on absorption maxima, Stereochemical factors. Cis-trans isomers, and cross conjugation. Application of electronic spectra of metal complexes-"3d' and 3d<sup>9</sup> hexa aquo metal complexes. Quantitative applications of electronic Spectroscopy, Beer's law application to mixture analysis and dissociation constant of a weak acid, Charge transfer spectra.

**NMR Spectroscopy:** Theory of NMR-Nuclear energy levels- Instrumentation-Relaxation phenomenon-spin-spin and spin-lattice relaxations. Shielding and de-shielding mechanism-chemical shift. Factors affecting the chemical shift. Isotropic and anisotropic effects-alkanes, olefins, acetylenes and aromatic systems. Low and High resolution of NMR spectrum of ethyl alcohol. Spin-spin coupling of strongly and weakly coupled systems-coupling mechanism-Types of coupling constants. Factor affecting coupling constants-hybridization-dihedral angle and steric effects. Applications of spin-spin coupling to structure and



stereochemistry of organic molecules - NOE and its applications, Lanthanide shift reagents.

**ESR Spectroscopy:** Introduction-Principles involved in ESR Spectroscopy. Instrumentation-Presentation of ESR spectra-Hyperfine coupling constant. ESR spectrum of hydrogen atom. Lande's splitting factor and its significance. ESR spectra of organic radicals like methyl, ethyl, isopropyl, benzene (anion & cation radicals) 1, 4-benzosemiquinone and naphthalene anion and Cu(II)-salicylaldehyde complex.

**Mass Spectroscopy:** Ionization of molecules - Instrumentation - Determination of molecular formula -General patterns of fragmentation - Preliminary account of chemical ionization - Applications of mass Spectroscopy in the structural determinations: Fragmentation patterns in different functional group systems.

**Combined Applications of UV, IR, <sup>1</sup>H NMR and Mass Spectroscopy.**

**Model Question Paper**

Time: 3 Hours

Max. Marks: 100

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<b>Section - B</b>	
b)	There shall be 7 essay type questions and 5 questions should be answered for 50 marks (10 x 50=50), and
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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**ELECTRONICS & INSTRUMENTATION ENGINEERING**  
**SYLLABUS**

**1. Engineering Mathematics:**

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigen values and eigen vectors. Transform Theory: Fourier transform, Laplace transform, Z-transform.

**2. Analog Electronics:**

Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity, generation and recombination of carriers, p-n junction diode, Zener diode, BIT, JFET, MOS capacitor, MOSFET. Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, Frequency response of amplifiers, Simple op-amp circuits, Instrumentation amplifier, precision rectifier, V-to-I and I-to-V converter, Op-Amp based active filters, criterion for oscillation, sinusoidal oscillators, 555 Timers.

**3. Digital Electronics:**

Basics of number system, Boolean algebra, minimization of Boolean functions, logic gates, digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers; decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor (8085): architecture, programming, memory and I/O interfacing.

**4. Signals and Systems:**

Periodic and aperiodic signals, sampling theorem, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT. Linear Time-Invariant (LTI) Systems: definitions and properties, causality, stability, impulse response, convolution, correlation, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems, IIR and FIR filters

**5. Measurements and Instrumentation:**

Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Measurement of voltage, current, power, power factor and energy. Extension of instrument ranges, Bridges for measurement of R,L and C, potentiometers, Q-meter. Digital multi-meter. Cathode ray oscilloscope. Resistive, Capacitive, Inductive and piezoelectric transducers, measurement of displacement, velocity, acceleration, force, torque, vibration, pressure, flow, temperature and liquid level.

## 6. Control Systems:

Basic control system components, reduction of block diagrams, open loop and closed loop (feedback) systems and stability analysis of these systems, signal flow graphs and their use in determining transfer functions of systems, transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, and Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, On-off, cascade, P, P-I, P-I-D, feed forward and derivative controllers.

## 7. Communications:

Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, super-heterodyne receivers, fundamentals of information theory and channel capacity theorem, pulse code modulation (PCM), differential pulse code modulation (DPCM). Digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), basics of TDMA, FDMA and CDMA and GSM.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**MECHANICAL ENGINEERING**  
**SYLLABUS**

**Heat-Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer, effect of turbulence; radioactive heat transfer, black and grey surfaces, shape factors, network analysis; Heat exchanger performance, LMTD and NTU methods.

**Thermodynamics:** Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle, irreversibility and availability; behavior of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

**Applications:** Power Engineering: Steam tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes.

**Production Engineering:** Introduction to metal castings, centrifugal and die casting, Introduction to Arc welding, TIG and submerged arc welding, Introduction to metal forming, principles of forging and drawing. Introduction to machine tools-lathe, milling, metal cutting principles, chip mechanism, tool life. Introduction to NC, DNC and CNC.

**Industrial Engineering:** Introduction to limits, fits and tolerances, breakeven analysis SQC, Job evaluation and merit rating. Introduction to production planning & control, Inventory - Basic EOQ model, P&Q systems, analysis, ABC PERT/CPM models, simple queuing models.

**Strength of Materials:** Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses.

**Design:** Design for static and dynamic loading; failure theories; strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**LAW**  
**SYLLABUS**

- 1. Constitutional Law & Administrative Law**  
Preamble  
Fundamental Rights and Duties  
Directive Principles of State Policy  
Rule of Law and Separation of Powers  
Delegated Legislation  
Principles of Natural Justice  
Writs
- 2. Jurisprudence**  
Nature and Sources of Law  
Positivism  
Natural Law Theory  
Sociological Jurisprudence  
Theories of Punishment  
Rights and Duties  
Ownership and Possession
- 3. International Law and Human Rights**  
Nature of International Law and its relationship with Municipal Law  
Sources of Law  
Recognition of States and Governments  
Human Rights- Meaning and Scope  
Universal Declaration of Human Rights  
Covenant on Civil and Political Rights  
Covenant on Social, Cultural and Educational Rights
- 4. Law of Contract**  
Essentials of a valid contract  
Offer, Acceptance and Consideration  
Capacity to contract- Minor's contract  
Elements vitiating contract- fraud, misrepresentation, public policy  
Coercion, undue influence, frustration of contract  
Remedies for breach of contract- Damages
- 5. Law of Crimes- General Principles**  
Nature and Definition of Offence  
General Exceptions  
Common Intention and Common Object  
Criminal Attempt, Conspiracy and Abetment

Offences against women

**6. Labor Law**

Concepts- Industry, Industrial Dispute and Workmen

Trade Unions- Rights and Immunities of Registered Trade Union

Registration and its advantages

Methods for settlement of Industrial Disputes under the Industrial Disputes Act, 1947.

Strikes and lockout as instruments of Collective Bargaining

Retrenchment, Lay-off and Closure

**7. Law and Social Change**

Kinds and factors of Social Change

Law as an Instrument of Social Change

Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 1989

Immoral Traffic (Prevention) Act, 1956

Child Marriage Restrain Act, 2006

**Model Question Paper**

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**PHARMACEUTICAL SCIENCES**  
**Branch: PHARMACEUTICAL CHEMISTRY**  
**SYLLABUS**

**Unit-I:**

1. Nucleophilic aliphatic substitution: SN1 and SN2 reactions; mechanism and kinetics; evidence for the mechanisms; structure and reactivity; stereochemistry; SN1 Vs SN2; role of solvent; substitution Vs elimination; nucleophilic substitution- alkyl halides Vs alcohols; SN1 and rearrangement; stability of carbocations;
2. Nucleophilic aromatic substitution: aryl halides; low reactivity of aryl and allyl halides; reactivity and orientation in nucleophilic aromatic substitution; bimolecular displacement reactions and mechanism; elimination-addition reactions and mechanism; evidence for the two-steps in bimolecular displacement.

**Unit-II:**

1. Structures of heterocyclic compounds; aromatic and Non-aromatic heterocycles; nomenclature; ring synthesis; reaction types most frequently used in heterocyclic ring synthesis; typical reactant combinations;
2. Cyclization reactions: displacement at saturated carbon, intramolecular nucleophilic addition to carbonyl groups,- intramolecular addition of nucleophiles to other double bonds, cyclization on to triple bonds, radical cyclization, carbene and nitrene cyclization; electrocyclic processes in heterocyclic ring synthesis; cycloaddition reactions; 1,3-dipolar cycloaddition, hetero-Diels-Alder reactions, (2+2) cycloaddition.
3. Reactivity of aromatic heterocycles; electrophilic addition at nitrogen; electrophilic, nucleophilic and radical substitution at carbon; deprotonation of N-hydrogen; organo metallic derivatives; palladium catalyzed reactions; oxidation and reduction of heterocyclic rings.

**Unit-III:**

1. Pyrroles, Furans and Thiophenes: Aromaticity; two synthetic methods for each class; reactions; electrophilic substitution; reactions with acids, carbenes, nitrenes; oxidizing and reducing agents; Diels-Alder reaction; photochemical reactions; alkylation of pyrroles; metalation of furans; reactions of thiophenes with nucleophiles.
2. Pyridines: nomenclature; physical and spectroscopic properties; tautomerism; synthetic methods; chemical reactions- with acids, electrophilic and nucleophilic substitution, Diels-Alder reaction, quaternization, reaction



with oxidizing and reducing agents; heterocyclic formation; ring opening reactions; reactions with free radicals; photochemical reactions; the Claisen rearrangement; derivatives of pyridine- alkyl and aryl pyridines, halopyridines, aminopyridines, pyridine N-oxide, hydroxypyridines, pyridine aldehydes and ketones.

3. Synthesis of Heterocyclic compounds:

Two methods of synthesis of the following heterocyclic compounds or their derivatives; (a) quinolines (b) isoquinolines (c) indoles (d) pyridazines (e) pyrimidines (f) pyrazines (g) thiazoles (h) thiazines (i) imidazoles (j) oxazoles

**Unit-IV:**

The origin and development, classification, structures, synthesis, mechanism of action, SAR, uses and toxicity of the following classes of Drugs:

1. Analgesics (non-opioid) and antipyretics.
2. Non-Steroidal Anti Inflammatory agents.
3. Steroidal Anti Inflammatory agents.

**Unit-V :**

The origin and development, classification, structures, synthesis, mechanism of action, SAR, uses and toxicity of the following classes of Drugs:

1. Beta-adrenergic blockers.
2. ACE inhibitors.
3. Calcium channel blockers.
4. Angiotensin-II blockers.

**Unit-VI:**

1. Psychopharmacological agents: biochemical basis of mental disorders; abnormal protein factors; endogenous amines and related substances; faulty energy metabolism; genetic disorders and nutritional disorders; phenothiazines-chemistry; synthesis; screening methods; pharmacological actions; SAR; mechanism of action; uses; toxicity; ring analogues of phenothiazines; fluorobutyrophenones; synthesis of chlorpromazine, prochlorperazine, fluphenazine, haloperidol.
2. Anxiolytics, sedatives and hypnotics: benzodiazepines and related compounds; barbiturates; other classes; mechanism of action; SAR; uses and toxicity synthesis of chlordiazepoxide, diazepam, alprazolam, Phenobarbital, meprobamate.
3. Antidepressants: MAO-inhibitors; tricyclic antidepressants; SAR; mechanism of action; uses; toxicity; other classes like : selective serotonin reuptake inhibitors, selective norepinephrine reuptake inhibitors, newer (non-tricyclic) non selective 5-HT and NE reuptake inhibitors; selective serotonergic reuptake inhibitors and 5-HT<sub>2A</sub> antagonists; 5-HT<sub>1A</sub> agonists and partial agonists and  $\alpha_2$ -antagonists. Synthesis of tranylcypromine, amitriptyline, fluoxetine, bupropion.

**Unit-VII:**

Structures, SAR, Mechanism of Action, Therapeutic uses, Toxicity of:

1. Penicillins, Cephalosporins and monobactams.
2. Morphine and analogues.
3. Vinblastine, vincristine, podophyllotoxin, taxol, camptothecin-their semisynthetic derivatives.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**Pharmaceutical Sciences**  
**Branch: PHARMACOLOGY**  
**SYLLABUS**

**UNIT-I**

- a. Drug Receptor theory: Concept of receptors, theories and forces involved in drug receptor interaction. Receptor polymorphism and dimerization and its importance in drug design. A detailed study of Ion channel modulators, Tyrosine kinase and G-Protein coupled receptors, cyclic nucleotides. b. A detailed study on: TNF, Apoptosis, Neurosteroids, Nitric oxide, Melatonin, Substance P and angiotensin II modulators, antioxidants.

**UNIT - II**

- A detailed study of the mechanism of action, pharmacology and toxicology of drugs used in :
- a. ANS- Parasympathomimetics and Parasympatholytics, sympathomimetics and sympatholytics, drugs acting at neuromuscular junction and ganglia,
  - b. CVS- anti ischemics, antihypertensives, antiarrhythmics, drugs for heart failure and dyslipidemia.
  - c. CNS - General anesthetics, sedatives and hypnotics. Drugs used to treat: anxiety, depression, psychosis, mania, epilepsy, neurodegenerative disorders, drug dependence and addiction.

**UNIT - III**

- A detailed study of the mechanism of action, pharmacology and toxicology of drugs used in
- a. Autocoids- A study of the mechanisms involved in the formation, release, pharmacological actions and possible physiological role of histamine, serotonin, kinins, prostaglandins, Systemic pharmacology of drugs acting as agonists and antagonist to the autocoids. Anti-inflammatory, analgesic & antipyretic agents, antiasthmatic agents,
  - b. Drugs affecting gastro intestinal function: Agents for control of acidity and antiulcer drugs, emetics & anti emetics,
  - c. Antidiabetic agents, anti-thyroid drugs
  - d. Chemotherapy of microbial infections, cancer and malaria.

**UNIT - IV**

Preclinical evaluation (Screening methods) of following categories of drugs:

- a. Autonomic nervous system: Sympathomimetics, Parasympathomimetics, anticholinergics, adrenolytics, Neuromuscular junction blockers.
- b. Cardiovascular Pharmacology: Cardiac glycosides, antiarrhythmics, antihypertensives, antiatherosclerotics .
- c. Free radical scavenging activity
- d. Drugs for metabolic disorders: Anti-diabetic agents, Hepatoprotective agents, Anti-hyperlipidemic agents
- e. Histamine antagonists

## UNIT - V

Organization of screening for the Pharmacological activity of the following:

- a. CNS Pharmacology: Sedatives, hypnotics, anxiolytics, antidepressants, Muscle relaxants. CNS stimulents, anticonvulsants, antipsychotics, Nootropics, antiparkinsonian agents,
- b. Analgesics, antipyretics, anti-inflammatory agents
- c. Immunomodulatory activity
- d. Gastrointestinal drugs: Antiulcer agents
- e. Respiratory pharmacology: bronchodilators
- f. Reproductive pharmacology: antifertility agents
- g. Anticancer agents

## UNIT - VI

- a. Bioassays: Basic principles of bioassays, official bioassays, experimental models and statistical designs employed in biological standardization : Acetylcholine, Adrenaline, Digitalis, Heparin, Insulin, d-tubocurarine, Histamine, HCG, Corticotrophine, Vasopressin, oxytocin
- b. Principles of Toxicological evaluations, ED 50, LD50 and TD values, acute, sub-acute and chronic toxicity studies .Guidelines and regulatory agencies - CPCSEA, OECD, PDA
- c. Alternatives to animal screening procedures, Cell-line, patch clamp technique, In-vitro models, molecular biology techniques. Concept of transgenic animals, knockout animals, nude animals, receptor binding assays, principles of immunoassay, patch clamp techniques.

## UNIT - VII

- a. **Drug absorption: Factors affecting drug absorption.**  
Gastro intestinal, percutaneous and rectal absorption  
Absorption kinetics, Wagner Nelson & Loo Riegelman methods  
BCS classification - significance  
Drug Distribution: Plasma Protein binding, kinetics and factors affecting Plasma

Protein binding, Transfer of drugs through biological barriers and drug transporters.

Biotransformation of drugs: Phase I & II biotransformation reactions

Excretion of drugs: Renal & nonrenal - mechanisms and factors affecting.

**b. Clinical Pharmacokinetics:**

- i. Basic concepts of Pharmacokinetics
- ii. Dose - response in man
- iii. Influence of renal and hepatic disease on pharmacokinetics
- iv. Therapeutic drug monitoring.
- v. Understanding of pharmacokinetics - pharmacodynamic relationships
- vi. Different pharmacodynamic models: Linear, Emax, Biophase distribution & indirect response models.

**Model Question Paper**

Time : 3 Hours

Max. Marks : 100

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**Pharmaceutical Sciences**  
**Branch: PHARMACEUTICS**  
**SYLLABUS**

- 1) Bioavailability and Bioequivalence - Detailed study including conduct, designs followed statistical interpretation.
- 2) Preformulation - goals, methodology, solubility, pKa and partitioning; drug excipient compatibility.
- 3) Dissolution - mechanisms, sink conditions, equipment, testing for different dosage forms, recent challenges and developments.
- 4) Stability testing - ICH guidelines of stability testing for drug products, photo stability testing; bracketing and matrixing, testing of formulations.
- 5) Polymers - classification, properties, applications. Biodegradable polymers for drug delivery.
- 6) Quality control testing of tablets, parenterals, aerosols and semisolids.
- 7) Novel drug delivery systems: preparation, applications and evaluation of buccal, transdermal, osmotic, nanoparticles, gastroretentive delivery systems.
- 8) Transport across cell membranes- drug efflux, pharmacogenomics, monoclonal antibodies. Drug targeting - protein & peptide drug delivery.
- 9) Maintenance, principle and working of autoclave, freeze dryer, spray dryer, validation of raw materials, analytical methods.
- 10) Tablets, aerosols, capsules, suspensions: Excipients used and manufacture. Coating materials and methods & equipment.

**Model Question Paper**

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**Pharmaceutical Sciences**  
**Branch: PHARMACOGNOSY AND PHYTOCHEMISTRY**  
**SYLLABUS**

**Unit I:**

- a) Herbal extracts: Types of extracts, extraction methods such as maceration, percolation, super critical fluid extraction and Distillation. Selection and purification of solvents for extraction .methods for drying of extracts.
- b) Preliminary phytochemical screening: Successive solvent extraction, Detection of different classes of phytoconstituents by test tube TLC and other methods (if any)

**Unit II:**

- a) Chromatographic Techniques: TLC, HPTLC, paper, and column chromatography (Flash, vacuum, HPLC, GLC.The various materials (stationary/ mobile phase) and detectors used in these Techniques. Applications of these techniques to material products along with their relative advantages and limitations.

**Unit III:**

- a) Qualitative and quantitative analysis of the following phytoconstituents by various methods:
  - i. Sennosides
  - ii. Digoxin
  - iii. Diosgenin
  - iv. Withanolides
  - v. Ergot alkaloids
  - vi. Atropine
  - vii. Phenolic, Aldehyde and Ketonic substances in volatile oils
  - viii. Curcuminoids
- b) Microscopical and physical methods of evaluation of crude drugs.

**Unit IV:**

- Screening of Herbal extracts/products for
- a) Acute toxicity studies
  - b) a) Antidiabetic b) Analgesic c) Anti-inflammatory d) Antimicrobial e) Cytotoxic f) Hepatoprotective g) Immunomodulatory activities.
  - c) Antioxidant properties.

**Unit V:** A study on the application of UVJR/HNMR,  $^{13}\text{C}$ NMR, spectroscopic techniques in the determination of structure of the folio wing classes of natural products with the help of simple examples: i) Alkaloids ii) Terpenoids iii) Flavanoids iv) Steroidal/Terpenoidal compounds.

**Unit VI:** Natural products as Drug leads: structural relationship, uses, merits and demerits (if any) of drugs derived/ developed from the following natural products: i) Quinine ii) Morphine iii) Salicin and Salicylic acid iv) Ephedrine v) Atropine vi) Cocaine vii) Podophyllotoxin viii) Vinca alkaloids ix) Ergot alkaloids x) Carotene xi) Diosgenin xii) 10-Deacetylbaccatin

**Unit VII:** Plant tissue culture : Types, techniques, nutritional requirements and Applications. Micropropagation of medicinal and aromatic plants. Immobilization, biotransformation and Hairy root culture.

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**Ph.D Entrance Test -2013**

**BOTANY**  
**SYLLABUS**

**UNIT-I**

- Thallus organization in algae.
- Economic importance of algae.
- Single cell protein studies with reference to *Spirulina*, *Chlorella* and *Scenedesmus*.
- Role of algae in water pollution.

**UNIT 2**

- Evolution of gametophyte in Bryophytes.
- Stellar evolution in pteridophytes.
- Heterospory and origin of seed habit.
- Fossilization and fossil types.

**UNIT 3**

- Current concepts in Taxonomy: A brief account with special reference to molecular taxonomy.
- Systems of angiosperm classification: Pre-Darwinian and post-Darwinian systems - A glimpse; APG - III
- International code of Botanical nomenclature (Vienna code)
- Biosystematics; Definition; Scope and Biosystematic categories.

**UNIT 4**

- Theories explaining organization of meristems.
- Lateral meristems; normal and anomalous secondary growth in Angiosperms.
- Ethnobotany: scope; interdisciplinary nature; ethnic tribes of Andhra Pradesh;
- Ethnobotanic medicine.
- Ethno-directed drug discovery, Ethno agriculture.

**UNIT 5**

- Reproduction in Fungi, Microbial interaction and plant-microbe interaction, Microbial treatment of Solid and liquid wastes; Microbial leaching and biomining.
- Physiological ecology of micro organisms - adaptations to environmental conditions;
- Leibing law of the minimum; Shelfords law of tolerance.
- Immobilization of enzymes and cells, biotechnology processes for microbial production of foods: cheese, mushroom cultivation.
- Microbial technology in agriculture: Biofertilizers and biopesticides.

## UNIT 6

- Theories and models of chromosome morphology and structure.
- Physical and chemical mutagens, Molecular basis of gene mutation.
- Transposable elements, Ac - Ds system in maize.
- Structural and Numerical changes in Chromosomes.

## UNIT 7

- Ultra structure of prokaryotic and eukaryotic cells.
- Cell cycle: molecular events and model systems, meiosis and apoptosis.
- Origin of life; Theory of organic evolution.
- Molecular evolution.

## UNITS

- Structure and functions of an ecosystem, Energy flow in ecosystem.
- Global biogeochemical cycles of carbon, nitrogen, phosphorus and sulphur.
- Environmental pollution, sources and control measures of air pollution and water pollution.
- Green-house gases and global warming.

## UNIT 9

- Double helix model of DNA. Mechanism of replication of DNA in prokaryotic and eukaryotes.
- Sex determination in plants.
- Extra chromosomal inheritance, Plastid inheritance in *Mirabilis jalapa*.
- Heterosis and somatic hybridization.

## UNIT 10:

- Biodiversity conservation: strategies
- Forest resources: Role of forests, factors responsible for degradation of forests: Forest management and conservation.
- Petroleum plants (Petroplants) - hydrocarbons from higher plants.
- Strategies for *in situ* and *ex situ* conservations: principles and practices.

## UNIT 11:

- Photo-oxidation of water, mechanism of electron transport, carbon assimilation; Calvin cycle, C4 cycle, CAM cycle and photorespiration.
- Nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction. Structure and regulation of Nif genes, transfer of nif genes into higher plants.
- Plant growth regulators: physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid and jasmonic acid.
- Lipid metabolism; structure and function of lipids, fatty acid biosynthesis, structure and storage of lipids and their catabolism.

## UNIT 12

- Symmetry: Types, origin, development, forms and functions.

- Polarity: Its expression in external and internal; structure, physiological manifestation and developmental pattern.
- Ultrastructure details of male and female gametophytes.
- Pollen-pistil interaction and stigma surface exudates; self and cross incompatibility and overcoming of incompatibility.

### UNIT 13

- Recombinant DNA technology: Gene cloning, principles and techniques, choice of vectors, construction of genomic and c-DNA libraries.
- Polymerase Chain Reaction and its applications - DNA finger printing, Blotting techniques, Southern, Northern and Western blotting.
- Agrobacterium mediated genetic transformation, Direct gene transfer techniques, reporter gene.
- Transgenics: current global status of transgenic crops.

### UNIT 14

- Micropropagation through tissue culture and its applications. Somaclonal and gametoclonal variations and crop improvement. Cryopreservation. Androgenic haploidy and its applications, Embryo rescue and wide hybridization.
- Phytochemistry: Introduction, retrospect and prospect; Phytochemistry and human welfare.
- Therapeutic uses of plant drugs, Phyto Pharmaceuticals, and Nutraceuticals.
- Biotechnological approaches and applications in crop improvement: Plant tissue culture, wide hybridization, protoplast culture and fusion, and plant genetic engineering.

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**GEOLOGY**  
**SYLLABUS**

Classification of crystals into 7 systems and study of their normal class, twinning crystals.

Nicol prism, indicatrix, optic sign.

Silicate structures, solid solution, polymorphism, pseudomorphism and Isomorphism, Mineral groups, pyroxene, amphibole feldspar and silica system.

Goldschmidt's Geo-chemical classification of elements.

Earthquakes causes its and effects, Volcanoes-origin and types. Mechanical weathering and chemical weathering.

Concepts of Geomorphology. Fluvial cycle, Karst topograph, Arid cycle.

Classification of fgneous rocks (IUGS). Textures and structures of igneous rocks.

Diopside-Albite-Anorthite system, Bowens reaction series

Lamprophyres, Kimberlites, Basalts, Granites and Carbonatities.

Types and Agents of Metamorphism

Structures and Textures of Metamorphic rocks.

Granulites, Eclogites and Greenschist facies.

Principles of Stratigraphy. Classification and nomenclature, Geological time-scale.

Morphology and geological distribution of Foraminefera, Ostracoda and Phylum Mollusca. Evolution of man and elephant.

Stratigraphic succession and mineral wealth of Archaean Cuddapah's and Gondwana.

Principles of stress and strain ellipsoid.

Classification and description of folds, faults and joints.

Structure and Tectonics of India, Interior of the earth, Plate tectonics.

Classification of Sedimentary rocks, Structures and Textures of sedimentary rocks. Sedimentary environments.

Origin and migration of petroleum and natural gas. Structural and Stratigraphic traps. Petroliferous basins of India, Origin and types of Coal.

Classification of mineral deposits, Nature and migration of ore-bearing fluids, Magmatic and hydro-thermal deposits. Oxidation and supergene sulphide enrichment deposits. Metallogenic epochs and provinces of India.

Hydrological cycle, Vertical distribution of Ground water, Ground water provinces of India, Ground water exploration, Water quality and pollution, ground water management, Rain water harvesting methods.

Remote sensing and its applications in Geoscience.

Mining methods, mineral beneficiation. Mineral economics, National mineral policy.

Types of mineral exploration methods, Mineral deposits, Occurrence, origin and distribution of Gold, Iron, Aluminium and Copper.

Application of GIS in Geo-science.

Mining and its impact on environment. Global warming. Environment conservation and management.

Role of Geologist in Civil Engineering. Geological considerations for geotechnical constructions.

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**MATHEMATICS**  
**SYLLABUS**

**ALGEBRA**

Groups, Quotient groups, Cyclic groups, Isomorphism theorems, Series, Solvable groups, Nilpotent groups, Group action on a set, Sylow theorems, Rings, Integral domains, Fields, Polynomial rings, Principal Ideal domain, Unique factorization domains, Euclidean domains, Gaussian Integers, Fields extensions, Splitting field, Normal extensions, Separable extensions, Finite fields, Galois theory.

**REAL ANALYSIS**

Metric Spaces: Open sets, closed sets, Compact sets, Connected sets. Sequences and Continuous functions in metric spaces. The Riemann - Stieltjes Integral, Sequences and Series of Functions, Fourier Series. Higher order derivatives and extreme values of functions of two variables.

Basic properties of Laplace transform, Applications of Laplace transforms to solve ordinary differential equations and integral equations of convolution type. The Lebesgue integral.

**DIFFERENTIAL EQUATIONS**

Definition of Legendre Polynomial of degree  $n$ , Rodrigues formula, Generating function, Recursion formula, Orthogonality of Legendre polynomials, Solution of Bessel equation of order  $p$ , - properties of Bessel functions, Recurrence formula, Generating function, Bessel's integral formula-Zeros and Bessel series- orthogonal properties. Formation of First Order Partial Differential Equations - Solution of Linear First Order Partial Differential Equations (Lagrange's Method)- Integral Surfaces Passing Through a Given Curve - Surfaces Orthogonal to a Given System of Surfaces-Compatibility, Charpit's Method -Jacobi's Method - Special Types of First Order Equations.

**COMPLEX ANALYSIS**

Analytic functions, conformal mappings, Bilinear transformations, Complex Integrals, Cauchy's theorem, Cauchy integral formula, Liouville's theorem, Fundamental theorem of Algebra, Maximum modulus principle. Taylor series, Laurent series. Residues, Cauchy residue theorem, Evaluation of improper integrals, Argument principle, Rouché's theorems.

**TOPOLOGY**

Topological spaces: The definition and examples, Elementary concepts. Open bases and Open-sub bases, Compact spaces, Products of spaces, Compactness for metric spaces. Separations-Spaces and Hausdorff spaces, completely regular spaces and normal spaces. Connected spaces, The Components of a space, totally disconnected spaces.

## **FUNCTIONAL ANALYSIS**

BANACH SPACES: The definition and some Examples, Continuous Linear Transformations, The Hahn-Banach Theorem, The Natural imbedding of  $N$  in  $N^{**}$ , The Open Mapping Theorem, The Conjugate of an Operator.

Hilbert Spaces: The Definition and some Examples, Orthogonal Complements, Orthonormal Sets, The Conjugate Space  $H^*$ , The Adjoint of an Operator, The Self-Adjoint Operators, Normal and Unitary Operators, Projections.

## **DISCRETE MATHEMATICS AND PROBABILITY**

Boolean Algebras: Boolean algebras - Boolean functions - Switching mechanisms - Minimization of Boolean functions - Karnaugh's map method. Graphs : Spanning Trees - Directed Trees - Binary Trees - Planar Graphs. Euler's Formula - Euler Circuits - Hamiltonian Graphs - Chromatic Numbers - The Four-Colour Problem.

Probability: Classical Probability- Axiomatic approach to probability -law of addition of probabilities-Multiplication law of probability -independent events- Baye's theorem.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
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**MICROBIOLOGY**  
**SYLLABUS**

**Unit: I**

- A. History and scope of microbiology: Discovery of micro organisms. Relevance of microbiology. Microbial taxonomy: Definition and systematics, Numerical taxonomy. Recent Trends in exploitation of microbial diversity.
- B. Details of the ultra structure of prokaryotic cell. General characters, thallus organization, cell structure, reproduction and classification of fungi.
- C. Detailed account of bacterial classification according to the 1<sup>st</sup> edition of Sergey's Manual of Systematic Bacteriology and 2<sup>nd</sup> edition of Sergey's Manual of Systematic Bacteriology
- D. Brief account of discovery of viruses, chemical composition of viruses Taxonomy of viruses: classification and nomenclature of viruses as per ICTV. Isolation, purification, cultivation, assay and characterization of bacterial, plant and animal viruses.

**Unit: II**

- A. Characters and classification of Carbohydrates, Amino acids, Proteins, Lipids, Vitamins and Nucleic acids. Buffers: Henderson and Hesselbach equation. Specific, intrinsic and reduced viscosities, viscometers and determination of molecular size and shape through viscosity. Osmosis in relation to molecular size and molecular weight,
- B. Principles of bioenergetics, Laws of thermodynamics, enthalpy, entropy, structure and energetics of ATP molecule and types of phosphorylation. Oxidation reduction reactions, measurement of redox potentials. Biological energy transducers. Chemiosmotic hypothesis and proton motive force and energy transformations. Mechanism of ATP synthesis. Inhibitors and uncouplers.
- C. Membrane structure and dynamics. Basic elements of signalling system. Cell cycle and regulation. Introduction to enzymology - properties and classification of enzymes, Mechanism of enzyme action, Fishers lock and key hypothesis, Koshland induced fit hypothesis, Haldane and Pauling concept. Enzyme activators. Enzyme kinetics, Michaelis Menton equation. Enzyme inhibition. Stability of enzyme.
- D. Transmission and scanning electron microscopes (TEM & SEM), Centrifugation techniques, Chromatography. General principles of electrophoresis. Types of Blotting techniques: Southern, northern and western blottings. Spectroscopic techniques: measuring the absorption and



application of UV- visible spectrophotometer, Fluorescence spectroscopic, NMR, ESR and Mossbauer spectroscopic method. Principle of Radioisotopes techniques:

### **Unit: III**

- A. Nutritional diversity in microorganisms, Uptake of nutrients, Chemotrophism, Phototrophism, Carbohydrate metabolism, Aerobic and Anaerobic respirations. Concepts of primary and secondary metabolisms, Lipid metabolism, Protein metabolism and Nucleotide metabolism.
- B. General principles of immunology, Structure and properties of Antigens - antibodies. Antigen and antibody interactions. Complement system, Immunogenetics, Tumor immunology and Classification of immunopathological disorders of Immunopathology,
- C. Immuno biotechnology: Active and passive immunization, recombinant antibodies and immunotoxins. Types of vaccines, recombinant vector vaccines, DNA vaccines, synthetic peptide vaccines and subunit vaccines, immunization procedures and adverse reactions to vaccines.
- D. Biostatistics: definition, scope, applications in biology. Measures of central tendencies, Probability, Chi Square test, Analysis of variance (ANOVA), Correlation, Regression and Importance of statistical software in data analysis.

### **Unit: IV**

- A. Chromosome organization in prokaryotes and eukaryotes. General principles, enzymology, various models of DNA replication. DNA damage and repair. Structural features of rRNA, tRNA and mRNA and their functions. General principles and basic apparatus of Transcription, mechanism of transcription and inhibitors of transcription. Post - transcriptional modifications. Translation, Basic features of genetic code, Wobble concept, prokaryotic and eukaryotic ribosomes. Post translational modifications
- B. Regulation of gene expression - Operon concept, regulatory elements of operon inducers, Detailed account of structure, function and regulation of lac operon, trp operon and ara operon. Global regulatory responses. Eukaryotic translational control gene expression, inhibitory RNA (RNAi) and Antisense RNA.
- C. Genetic recombination in bacteria. Transformation, transduction, sexduction and conjugation; recombination in phages and genotype mixing. Molecular basis of recombinations. Gene mapping in prokaryotes. General account of plasmids and Transposable elements.
- D. Types of mutations and mutagens. Mutation screening in microorganisms. Outlines of cancer biology. Essentials of recombinant DNA technology. Applications of rRNA technology in medicine and industry. Gene therapy.

Polymerase chain reaction (PCR) technology. Different versions of PCR. DNA libraries. Genetically engineered organisms.

#### **Unit: V**

- A. Fermentation processes primary and secondary metabolites, strain improvement and maintenance. Formulation of industrial media. Stoichiometry of cell growth and product formation. Basic design of a microbial fermentor, Body construction and Types of fermentations.
- B. Importance of downstream processing in industrial fermentation processes, bio product recovery and purification. Fermentation economics. Brief out lines of processes for the production of Primary and Secondary metabolites
- C. Principles and concepts of Environmental profile. Microbiology and its role in conservation and management of natural resources .Soil principles and properties. Decomposition of organic matter, Bioremediation of polluted soils, Microbial leaching and biomining.
- D. Biomonitoring of the aquatic environment, Waste water treatment through aerobic and anaerobic microorganisms. Pollution control biotechnology. Air sampling techniques. Emission control technology. Environment and bioenergy. Lignocellulosic material as bioenergy source. Bioethanol in social and scientific perspective. Biogas.

#### **Unit VI**

- A. Microbiology and ecological significance of nitrogen cycle .Biology of nitrogen fixation, Rhizosphere, phyllosphere microflora. Principles of plant pathology. Crop diseases. Plant diseases by fungi, bacteria, viruses and phytoplasma. Disease resistance in plants, Biochemical basis of disease resistance, Transgenic Resistance. Principles, symptoms and control measures of Plant diseases.
- B. Classification and characteristics of medically important microorganisms and laboratory. Study of etiology, cultural characters, antigen structure, biochemical properties, diagnostic tests of pathogenic bacteria. Sexually transmitted diseases, Water borne infections and zoonotic diseases.
- C. Superficial mycoses, Cutaneous mycoses , Subcutaneous mycoses .Endemic mycoses, Opportunistic mycoses, Influenza virus, rubella, mumps, measles and Japanese encephalitis, sexually transmitted viral diseases. Antimicrobial agents; screening and assay of antimicrobial compounds. Mode of action of antimicrobials.
- D. Microbes important in food microbiology: Factors influencing food spoilage. Food poisoning and food borne infections. Detection of microbial contamination of foods Contamination and spoilage of foods. General principles of food preservation. Normal flora of milk and milk products, Spoilage of milk and milk products.

## Unit VII

- A. Microbial products of food ,SCP, oriental foods, fermented beverages and fermented meat and meat products. Yeasts fermentation and a yeast products, Industrial production of enzymes, Immobilization of enzymes and their applications. Scope, utility and methodology of biotransformation, Industrial production of Biopesticides, Biofertilizers, Biopolymers, Biosurfactants and Vaccines.
- B. The concept of intellectual property, Patents, copy right and neighboring rights. Forms of intellectual property protection, International treaties and conventions with special reference to biodiversity. Indian patent laws. Genetically engineered microorganisms and their products, Concept of biosafety, Biohazard, Requirements and procedures for recombinant DNA.
- C. Language skills for writing scientific articles. Format of scientific writing. Publishing manuscript and writing project proposals. Communication skills: Planning, preparation and design of oral presentations, Poster presentations. PowerPoint presentations.
- D. Bioinformatics: definition, concept, scope, relevance of bioinformatics, development of bioinformatics, applications of bioinformatics. Genomics, proteomics. Databases. Search tools. Sequence analysis of biological data. Phylogenetic analysis. Gene prediction.

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**PHYSICS**  
**SYLLABUS**

**Unit -I**

**Mathematical Physics:** Solution of second order differential equations (Hermite, Legendre, Laguerre). Beta and gamma functions (evaluations and transformation). Mypergeometric functions and their representation and transformation. Fourier and Laplace transforms and their properties.

**Classical Mechanics;** Generalised coordinates-Hamilton's variational principle - Lagrange eqations from D' Alemberts principle - Hamilton's canonical equations - modified variational principle -canonical transformations - Poissons brackets - Hamilton-Jacobi equation - action angle variables. Rigid body dynamics: Kinetic energy of rigid body - Euler's equations-symmetrical top.

**Unit - II**

**Quantum mechanics:** Principle of superposition - Dirac's bra and ket notation - eigen values and eigen vectors of Hermitian operators - complete set of states and commuting operators -orthonormality - position and momentum representation - Schrodinger, Heisenberg and interaction pictures - exactly solvable problems (harmonic oscillator, Hydrogen atom) - angular momentum operators - eigen values of P and  $J_z$  - addition of angular momenta and Clebsh-Gordon coefficients - time independent (degenerate and non-degenerate) and dependent perturbation theory and applications - variation method - relativistic quantum mechanics (Klein Gordon and Dirac's equations).

**Statistical mechanics:** Micro and macro states - phase space - ensemble and ensemble average -Liouville's theorem - Microcanonical, canonical and grand canonical ensembles and partition functions - Fermi-Dirac and Bose-Einstein distribution functions from grand partition function -equation of state for quantum gases - Planck's distribution law - Bose-Einstein condensation-Liquid He - superfluidity - Boltzman transport equation - electrical and thermal conductivity - Weidermann-Frenz law.

**Unit - III**

**Electromagnetic theory:** Gauss law and its applications - Laplace and Poisson equations -electrostatic boundary conditions - magnetic vector potential - magnetic boundary conditions -scalar and vector potentials - Coulomb and Lorentz gauge - retarded potentials - Jefimenko's equations - Lienard-Wiechart potentials. Maxwell's equations and magnetic charge - continuity equation - Poynting theorem - Newton's third law of electrodynamics. Energy and momentum of electromagnetic waves in vacuum and non-conducting media -

propagation through linear media -reflection and transmission at normal and oblique incidence - reflection and transmission at a conducting surface.

**Nuclear Physics :** Basic nuclear properties(size, shape, charge distribution, spin and parity) -binding energy - semi-empirical mass formula - liquid drop model - fission and fusion - nature of nuclear forces - form of nucleon-nucleon potential - charge independence and charge symmetry of nuclear forces - isospin - deuteron problem - elementary ideas of alpha, beta and gamma decay - classification of fundamental forces - elementary particles (quarks, baryons, mesons, leptons)-spin and parity assignments-strangeness - C, P and T invariance and application of symmetry arguments to particle reaction - parity non-conservation in weak interaction.

#### **Unit - IV**

Solid state physics; X-ray diffraction-Lane equations - Ewald sphere. Elastic vibrations: group velocity and phase velocity - vibrations of mono-atomic and diatomic lattices - concept of phonons - infrared absorption of ionic crystals - thermal expansion and thermal conductivity. Kronig Penny model - Brillouin zones. Langevin's theory of diamagnetism -quantum theory of paramagnetism - Weiss molecular field theory of ferromagnetism -ferromagnetic domains - concept of magnons. Superconductivity: type-I and type-II superconductors - Josephson junctions - lattice defects and dislocations - ionic conductivity and diffusion. Nano-particles - metal clusters and semiconductor nano-particles - carbon nanotubes and quantum nano-structures.

**Spectroscopy:** Nuclear magnetic resonance - resonance condition, classical theory and Bloch equations - relaxation processes - spin-lattice and spin-spin relaxations - chemical shift. Electron spin resonance - condition for resonance - spin hamiltonian - hyperfine structure -ESR spectra of free radicals - ESR-instrumentation.

**Electronics:** Semiconductor and opto-electronic devices(diode, BJT, FET, LED, Solar cell) and their characteristics - regulated power supply - RC coupled amplifier and its frequency response -transformer coupled push pull power amplifiers - RC phase shift oscillator - Colpitts oscillator -astable multivibrator - digital techniques and applications(flip flops, registers and counters) -operational amplifier characteristics - inverting and non-inverting amplifiers -addition, subtraction, differentiation and integration - active filters(low pass, high pass and band pass).

## Model Question Paper

Time : 3 Hours

Max. Marks : 100

<b>Section – A</b>	
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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test Test -2013**

**STATISTICS**  
**SYLLABUS**

1. **Mathematical Analysis:** Uniform convergence of Sequences and Series of functions Cauchy criterion for uniform convergence, Mn test and Weierstrass M test., Improper integrals of first and second kind, Statement of comparison test for convergence, definition and convergence of Beta and Gamma functions. Functions of Several Variables, Concept of Partial derivatives, maximum and minimum values of functions of two variables, methods of Lagrange multipliers. Functions of Complex Variables : Concept of continuity and derivative of complex function - Analytic function - Cauchy-Riemann equations - Statements of Cauchy Theorem, Cauchy integral formula, Statements of Taylor's and Laurent's series - Singular points - Poles - Residues.
2. **Matrix theory:** Quadratic forms in real field - rank and index - Classification of real quadratic forms - necessary and sufficient condition for a definite form. Characteristic roots and Characteristics vectors of a matrix - nature of Characteristics roots of Hermitian and Orthogonal matrices,. Generalized Inverse of a Matrix: Definition of generalized inverse and its applications to solution of linear equation - the Moore Penrose inverse - Least squares solutions of inconsistent linear equations.
3. **Probability Theory:** Random variables: distribution function and its properties. Joint distribution of two random variables, marginal, conditional distributions. Expectation of random variable, Moments and Moment generating function. Expectations of functions of random variables, Conditional expectation, conditional variance-examples. Characteristic function and its properties. Inversion and uniqueness theorems with examples (Functions which cannot be characteristic functions). Levy continuity theorem. Inequalities: Tchebychevs, Markov, Cauchy-Schwartz, Jensions, Liapunovs, Holders, Minkowskys inequalities. Convergence of a sequence of random variables: Convergence in law, in probability, almost sure convergence, and convergence in r-th mean and their interrelationships. Borel - Cantelli lemma, Borel 0-1 law. Law of large numbers: Weak law of large numbers, Bernoulli and Khintchins WLLN, Kolmogorov's inequality, Borel SLLN, Kolmogorov SLLN for independent r.v.'s and for iid r.v's, examples. Central Limit theorem: Demovire-Laplace CLT, Lindberg-Levy CLT, Liapunov's CLT, statement of Lindberg - Feller form of CLT with examples.
4. **Distribution Theory:** Theoretical distributions Normal, lognormal, exponential, Cauchy, Weibull and Cauchy distributions- properties and applications. Bivariate

normal, multivariate normal and multinomial distributions with their properties and applications. Functions of random variables and their distributions using Jacobean of transformations, Distribution of Central Chi - squares, t and F distributions with their properties and applications. Non-Central Chi-squares, t and F distributions and their properties (Statements only). Distribution of  $\bar{X}$  and  $s^2$  for samples from normal population. Distribution of Order statistics and Range. Joint and marginal distribution of order statistics. Distribution of sample quantiles.

5. **Estimation Theory:** Unbiasedness, sufficiency, consistency and efficiency of a point estimate with examples. Neyman's factorization theorem, UMVU estimation, Cramer-Rao inequality, Rao-Blackwell theorem, Fisher's information, Bhattacharya bounds, completeness and Lehman - Scheffe Theorem. Median and Modal unbiased estimation, Method of moments and maximum likelihood estimation. Examples of MLE, consistency and asymptotic normality of the consistent solutions of likelihood equations. Definition of CAN and BAN estimators and their properties-examples. Concept of U statistics and examples. Interval estimation- method of pivot and shortest length confidence interval. Confidence interval for the parameters of Normal, Exponential, Binomial and Poisson distributions. Confidence interval (CI) for quantiles, Tolerance limits and examples.
6. **Testing of Hypotheses:** Concepts of tests of statistical hypothesis, types of error, level of significance, power, critical region and test function. Concepts of MP and UMP tests. Neyman-Pearson lemma and its applications, one parameter exponential family of distributions. Concepts of unbiased and consistent tests. Likelihood ratio (LR) criterion with simple applications (including homogeneity of variances). Statements of asymptotic properties of LR tests. Large sample tests of population means, proportions and correlation coefficients. Relation between confidence intervals, and hypothesis testing. Wald's SPRT for testing a simple null hypothesis against simple alternative hypothesis and its OC and ASN functions. SPRT procedure for binomial, Poisson, normal and exponential distributions. Concepts of loss, risk and decision functions, admissible and optimal decision functions, estimation and testing viewed as decision problems, a priori, a posteriori distributions, conjugate families, Baye's and minimax decision functions with applications to estimation with quadratic loss.
7. **Non - Parametric Tests:** Non - parametric tests for (i) one sample case: Sign test, Wilcoxon signed rank test for symmetry, runs test for randomness, Kolmogorov -Smirnov (K-S) test for goodness of fit, chi-square test for goodness of fit and independence in contingency tables, (ii) two sample case: Sign and Wilcoxon tests for paired comparisons. Wilcoxon - Mann Whitney test and K-S test and tests for independence based on spearman's rank correlation and Kendalls Tau, Kruskal-Wallis test and Friedman's test.
8. **Multivariate Tests:** Principal Component Analysis, Factor analysis, Canonical Correlation, Cluster analysis. Multivariate tests based on Hotelling's T<sup>2</sup> and



Mahalanobis D2 statistics for one sample problem, two sample problem and classificatory problems between two normal populations based on Fisher's discriminant function.

9. **Statistical Process and Quality Control:** Construction of control charts for attribute and variable data, O.C, ARL of control charts. Moving average and exponentially weighted moving average charts, Cu-sum charts using V-masks. Acceptance sampling plans for single, double and sequential sampling plans and their properties. AOQ, AOQL. Designing RSP for specified AOQL and LTPD. Process Capability analysis, capability indices Cp, Cpk, and Cpm.
10. **Sampling Techniques:** Estimation of population mean, population total and variance of the estimator in the following sampling Methods. Cluster sampling with clusters of equal and unequal cluster sizes. Two stage sampling with equal and unequal first stage units. Ratio and Regression estimators in Simple Random Sampling and Stratified Random Sampling. Unequal probability sampling-PPSWR/WOR methods-Hansen-Horwitz estimator, Horvitz -Thompson estimator and Yates and Grundy variance estimators, Non - sampling errors- Sources and treatment.
11. **Linear Models and Regression Analysis:** Gauss - Markov linear model, BLUE for linear functions of parameters, Gauss-Markov theorem, Aitken's generalized least squares. Concept of multicollinearity. Analysis of multiple regression models-Estimation and testing of regression parameters, tests of sub - hypothesis. Derivation of multiple and partial correlations coefficients and testing for the same. Robust, Ridge regression procedures.
12. **Design and Analysis of Experiments:** Analysis of variance two - way classification model with more than one (equal) observations per cell with interaction. Fisher's least significance difference (LSD) method and DMRT. Analysis of covariance one-way and two - way classifications. Analysis of  $2^k$  ( $k = 2, 3, 4$ ) and  $3^2$  factorial experiments. Total and partial confounding of  $2^2$ ,  $2 \times 2^4$  and  $3^2$  factorial designs. Concept of balanced partial confounding. Split plot design and its analysis. Balanced incomplete block design (BIBD) - parametric relations, Intra - block analysis and recovery of inter block information. Partially balanced incomplete block design with two associate classes (PBIBD (2)) - parametric relations and intra -block analysis. Youden Square design and Simple Lattice Design with analysis. Concept of Response Surface Methodology (RSM), the method of Steepest Ascent. Response Surface Designs-designs for fitting first order and second order models. Variance of estimated response. Second order Rotatable Designs (SORD), central composite designs (CCD)-role of CCD as alternative to  $3^k$  designs, rotatability of CCD.
13. **Reliability Theory :** Reliability concepts, Systems of components, Series and parallel systems, Coherent structures and their representations in terms of paths and cuts, Modular decomposition. Reliability of coherent systems, Reliability of

independent components, Association of random variables. Bounds on system reliability and improved bounds on system reliability under modular decomposition. Life distribution, aging, IFR, DFR, DFRA, NBU and NBUE classes, Exponential distribution and its no aging property, Reliability estimation in two-parameter Gamma, Weibull and Log-normal distributions.

**14. Optimization Techniques :** LPP, Various types of solutions to an LPP, Duality in LPP, Transportation and Assignment problems and their solutions, Game theory. Integer Programming Problem, Queuing and Inventory problems. Basic concepts of Networks constraints; Construction of Network and critical path; PERT and CPM.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
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**ZOOLOGY**  
**SYLLABUS**

**UNIT-I: INVERTEBRATA**

1. Species concepts - species category, different species concepts; sub-species and other infra-specific categories
2. Acoelomates and pseudo coelomates - Coelomates - Proterostornia and Dueterostornia
3. Patterns of feeding and digestion in metazoan
4. Modifications in the digestive system of invertebrates with Special reference to modifications in Arthropoda & Mollusca
5. Respiration: Respiratory pigments. Organs of respiration-gills, trachea and lungs; mechanism of respiration
6. Organs of excretion-coelome, coelomoducts, Nephridia, Malphighian tubules.
7. Mechanism of excretion and osmoregulation
8. Nervous system: coelenterates and Echinodemata
9. Nervous system: arthropods (Crustaceans and Insects) and Molluscs (Cephalopoda)
10. Larval forms of free living invertebrates (Coelenterata, Annelida, Arthropoda, Mollusca and Echinodermata)

**UNIT- II: VERTEBRATA**

1. Concept of proto-chordata, and its significance
2. Origin of chordates and classification
3. Derivatives of Integument glands, scales, horns, claws, hoofs, feathers & hair.
4. Anatomy of gut in relation to feeding habits- herbivores, carnivores and omnivores
5. Respiratory organs in fishes and amphibians
6. Sense organs, simple receptors, organs of olfaction and taste, Lateral line system and Electric organs
7. Evolution of Urino-genital system in vertebrate series.
8. Fresh water fishes of India - Method and techniques of taxonomic study Fish culture in fresh waters
9. Pathogenic and nutritional diseases in fishes
10. Animal parasites of fishes (Protozoan, Helminth, Crustacean)

**UNIT- III: GENETICS, EVOLUTION AND ETHOLOGY**

1. Concept of gene
2. Gene frequency. Factors influencing the genetic equilibrium
3. Genetic structure of Natural Populations genotypic & Phenotypic variation.
4. Molecular Methods in Genetic variation patterns of changes in nucleotide and amino acid sequences.
5. Darwinism, Neo Darwinism. Hardy & Weinberg law. Mutation Genetic drift meiotic drive.
6. Evolution of gene families. Assessment of molecular variation. Trends of origin of higher organisms.
7. Construction of phylogenetic trees, Inference distance method, parsimony method.
8. Loss of genetic variation and methods of conservation of genetic resources.
9. Definition of ethology. Introduction and History of ethology. Ethology Vs Behaviourism. Instinct Vs Learning.

**UNIT-IV: CELL BIOLOGY, MOLECULAR BIOLOGY AND HISTOCHEMISTRY**

1. Architecture of the cell - Cell cycle, apoptosis - Cell interactions.
2. Organelles. Lysosomes, Mitochondria golgi apparatus, Nucleus & Nucleolus.
3. Fine structure of chromatin & Chromosomes.
4. The concept of gene and genome, eukaryotic genome organization structural variations of DNA & RNA.
5. Concept of RDNA technology
6. Problems involved in DNA technology with reference to eukaryotic gene. Expression in prokaryotes.
7. Transgenic animals.
8. Chemical action of fixatives on cell and tissue components
9. Enzymes as histochemical reagents, Localization of enzymes in tissues (Alkaline and acid phosphates)

**UNIT - V: ANIMAL PHYSIOLOGY AND IMMUNOLOGY**

1. Carbohydrates, Proteins, lipids & Nucleic acids
2. Concept of turnover, breakdown and resynthesis of living molecules - Redox potential, electron transport - Nomenclature, Classification - Enzyme kinetics - Michaelis - Menten equation. Determination of  $V_{max}$  and  $K_m$ .
3. Regulation of enzyme activity Mechanism of enzyme action. Allosteric enzymes: Models of PFK, ATC. Mechanism of enzyme action - active site, chymotrypsin as model.
4. Hormonal control of carbohydrate, protein, and Lipid metabolism.

5. Glycogenesis, Glycogenolysis, Gluconeogenesis, Transamination, Deamination, Urea-cycle, B-oxidation. Fattyacid synthesis.
6. Diseases associated with carbohydrate, Amino acid and lipid metabolism.
7. Nutritional types. Balanced Diet Essential Nutrients: Types of food, Vitamins, Minerals & Water
8. Digestion and absorption. Neuroendocrine regulation of gastro - intestinal movements and secretions.
9. Breathing movements and exchange of respiratory gases at the pulmonary surface.
10. Respiratory quotient Respiratory Pigments Transport of respiratory gases Components of blood and functional significance. Cascade of biochemical reactions (factors) involving in blood coagulation.
11. Functional anatomy of mammalian kidney and its renal units. Physiology of urine formation. The significance of Henley's loop in mammals. Role of hormones in renal physiology.
12. Types of synapses, mechanism of synaptic transmission. Cholinergic and adrenergic, Motor -end plate or Neuromuscular junction  
Types of muscles: striated, non-striated and cardiac muscles. Ultra structure of striated muscle
13. Cells of the immune system and their differentiation Lymphocyte traffic and immune response
14. Structure and Functions of Antibodies Classes and subclasses Gross and Fine structure, Antibody diversity
15. Antibody mediated effectors function Antigen - Antibody interactions in vitro and in vivo T-Cell maturation, differentiation and thymus - T-cell isolation, molecular components and structure TH-cell activation mechanism - Cell death and T-cell population B-cell receptors B-cell generation, activation, differentiation and proliferation Structure and functions of Cytokines Cytokine receptors and immune response Cell adhesion molecules, Effectors cells & molecules. CTL & NK cells-mechanisms of action
16. Immunological tolerance and Anti-immunity - Hypersensitivity and Delayed type hypersensitivity.
17. Immune responses to intracellular parasites.

## **UNIT-VI: REPRODUCTIVE PHYSIOLOGY**

1. Endocrine glands. Chemical nature and classification of hormones.
2. Hormones and their receptors.
3. Spermatogenesis and its hormonal regulation
4. Accessory reproductive organs (glands) - oogenesis and its hormonal regulation.
5. Fertilization and post fertilization events

6. Assisted reproductive technologies. Transgenic animals and gene knock-outs.
7. AIDS and sexually transmitted diseases
8. Ageing of Reproduction

#### **UNIT- VII: ENVIRONMENTAL BIOLOGY**

1. Concepts and classification of natural resources
2. Management of Non-renewable resources, (Mineral resources, land resources, soil resources oceanic resources)
3. Management of Renewable Resources (solar energy, wind energy, wave and tidal energy, Geothermal Energy and Biogas.)
4. Management of Forest resources. Wildlife resources in India
5. National parks and wildlife sanctuaries - Wildlife legislation
6. Concepts of biodiversity conservation (Cultural and Ethical aspects) - Soil Biodiversity and its role in ecosystem services - National and International conservation strategies.
7. Definition of eco-technology and its application - Use of micro-organisms for environmental clean-up - Life tables
8. Population growth forms - Stochastic models of population growth - Intra specific and inter specific competition
9. Niche concept
10. Population regulation extrinsic and intrinsic mechanisms - Natural hazards

#### **UNIT - VIII: BIOSTATISTICS, TOOLS AND TECHNIQUES FOR BIOLOGY**

1. Measures of central Tendency - Mean median, Mode, standard deviation - Analysis of Variance
2. Introduction to Bioinformatics Definition and its applications in life sciences.
3. Introduction to Genomics and Proteoinics - Functional genomics and proteomics.
4. Principles and uses of analytical instruments-Balances, pH meter, colorimeter, spectrophotometer, ultracentrifuge, ESR and NMR.
5. Microscopy-Principle of light transmission, electron, phase-contrast, fluorescence, electron: transmission, Scanning, Confocal Microphotography, Image Analysers. Microtomy Techniques
6. Collection & preservation of animals tissue - fixation embedding
7. Molecular separation by chromatography, electrophoresis; precipitation etc.,
8. Cell separation by flowcytometry, density gradient centrifugation, unit gravity centrifugation affinity adsorption, anchorage based techniques etc.

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
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**ECONOMICS**  
**SYLLABUS**

1. Significance of Classical Political Economy - Plato, Aristotle, Roman Economic ideas-Mercantilism- Physiocracy -Classical Theory of Value- Distribution - Adam Smith and David Ricardo- Marxian Theory of Development - Karl Marx - Labour Theory of Value- Surplus Value- Schumpeter's Theory of Capitalist Development. Feudalism as a mode of production - Industrial Revolution- Theories of Imperialism - - Dependency Paradigm- Economic ideas of Dadabhai Nauroji- R.C. Dutt- M.G. Ranade- Narayana Guru- M.K. Gandhi.- Buddha Dharma, Jyothi Rao Phule, Kawtilya's Artha Sastra and Ambedkar on casteism.
2. Cardinal - Ordinal Utility Analysis - Income and Substitution effects - Indifference curves -Slutsky theorem - Revealed Preference Theory - Hicksian Revision of Demand Theory -Methods of Demand forecasting.-Theory of Production and Costs-Modern theory of costs - Linear Homogeneous Production Function - Properties of Cobb-Douglas Production and CES Production Functions -Pricing of output under different market structures - Monopoly - Discriminating monopoly -Monopolistic competition - Oligopoly - Break- even analysis- Game theory. Theory of Distribution - Neo-Classical theory of Distribution- Marginal productivity theory- Euler's theorem - Clark -Wicksteed - Walras's Production Exhaustion theorem.-Welfare Economics - Criteria of social welfare - Pare optimality, Kaldor-Hicks compensation criteria - Bergson's Criteria - Arrow's Impossibility theorem -Amarthya Sen's theory of social choice.
3. Importance and Concepts of National Income- Problems in Estimation of National Income.-Basic Keynesian Model - Keynesian consumption Function - Investment Multiplier and Accelerator- IS-LM Curves - Equilibrium in Product and Money Markets.- Absolute Income Hypothesis - Relative Income Hypothesis - Life Cycle Hypothesis and Permanent income Hypothesis - Investment Demand Function -Post- Keynesian and Neo-Classical Approaches.- Quantity Theory of Money -Rational Expectations Hypothesis - High powered money and money multiplier. Macro Economic Policies -Objectives of Macro economic policy - Monetary policy & Exchange rate policy- Income Policy -Fiscal Policy - Stabilization Policies in India - Relative Efficiency of Monetary and Fiscal Policies.-Developmental role of RBI - Macro Economic Stabilization and Structural adjustment - Financial Sector Reforms and critical appraisal of structural adjustment policies
4. Concept of Matrix and its types- Determinant and their basic properties. Matrix inversion and rank of a matrix - Solution of Simultaneous equations through Cramer's rule. Mean, Median, Mode -Geometric Mean and Harmonic Mean -



Measures of Dispersion - Range, quartile Deviation, Mean Deviation, Standard Deviation - Coefficient of Variation - Skew ness and Kurtosis.-Least Squares Method and interpretation of Regression Co-efficient. Concept of Probability - various types of events - classical and empirical definitions of probability; Laws of addition theorem - multiplication theorem - Baye's theorem - Elementary concept of random variable. Basic concepts of sampling -simple random and stratified random sampling - Time Series Analysis - Components of Time series- Calculation of straight line trend by OLS Method - moving averages method - concept of Index number - Lapeer's, Pascoe's and Fisher's methods.

5. Theories of Trade - Adam Smith, Ricardo; Neo-Classical Theories; Modern Theories of Trade -Hecksher and Ohlin Model; Factor Price Equalization. Causes for disequilibrium in Balance of Payments and Measures to correct disequilibrium; Expenditure reducing and Switching Policies; Devaluation - Determination - Fixed or Flexible exchange rate; Purchasing Power Parity Theory. -IBRD, IMF, IDA, ADB, WTO EXIM Policy.
6. Multiple theory of Public Household - The Principle of Maximum Social Advantage- Taxation; Theories of Incidence - Traditional and Modern Approaches -Benefit Approach - Ability to pay approach - Neutrality Approach - Public Expenditure - Wagner's Law - Peacock - Wiseman Hypothesis - Criteria for public investment - Social Cost - Benefit Analysis - Budget Classification - Programming Budget - Zero - Based budgeting.-Public debt management - Redemption of public debt - Public debt and third World Countries. Principles of Federal Finance - Centre-state Financial Relations-Pricing policy in public enterprises - Disinvestment-Fiscal Policy - Objectives of Fiscal Policy - Interdependence between monetary and fiscal policies - salient features of Indian Tax system - VAT.
7. Growth and Development - Human Development approach - essential components of Human Development- Schumpeter and Capitalist Development- Rostow's stages of Economic growth -Harrod Domar growth model- R.M. So low's Model-Big Push- Critical Minimum Effort and low level Equilibrium Trap - The Theory of Balanced and Unbalanced Growth- Lewis Model of unlimited supply of labour - Role of Technology in Economic Development— spread effects and backwash effects. Economic stagnation during the British -Problems of Agriculture and Industrial sectors -Drain of Wealth - Fifty years of planned development - Inter-State variations in Development -emergence of informal sector in India.-demographic features of India's population - Rural-Urban Migration - Urbanization -Recent trends in HDI, PQLI, GEI, GDI and other Development indices with special reference to India.- Education- Health- Environment- Transport.
8. Concepts of Poverty and Income Inequalities - the theories of employment determination in developing countries- Mahalanobis - Two Sector and Four Sector models- Resource mobilization-Role of Borrowing - public

expenditure-Deficit Financing in developing countries- Foreign investment and aid; components of foreign aid to developing countries - Basic features of the process of development in UK, USA, Japan and China- Pattern of Development in Market economy -model of south Korea -Populist model of Tanzania and planned economy model of Cuba. Institutional Structure - land reforms in India - pricing of agricultural inputs and output - Agricultural Marketing -Issues of food security- Industrial policies-Problem of industrial sickness in India - 1991 IPR-Problems of Industrial labour in India. - FERA- Exchange rate policy- Foreign capital and role of MNCs in India- Trade reforms in India- WTO and its impact on the different sectors of the economy- Need for good governance.

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**HISTORY**  
**SYLLABUS**

**SECTION – A-INDIAN HISTORY**

- Unit-I :** Sources, the Indus Valley Civilization-The city-The People-Main features-Religion, contacts with West Asia and destruction of the Indus Valley Civilization -Vedic culture - Socio-economic life and Religious conditions - Condition of Northern India in 6<sup>th</sup> Century B.C., Social, and Religious conditions - Rise of Jainism & Buddhism and contribution of Jainism and Buddhism to the Indian culture, Mauryan period-Administration-Socio-Economic conditions and the Mauryan Art. Asoka's Dharma or Dhamma. Causes of the downfall of the Mauryas - Satavahanas - Socio-economic - Cultural conditions - Gupta Age-salient features of Gupta Age-Administrative Organization - Socio-Economic and Religious conditions-Literary Activity-Sciences-Education, Art & Architecture- Fahien's account Puswabhuthi Age: Harsha's Administration, Religion, and patronage to Learning-Ancient Universities - Accounts of-Hiuen-Tsang-Estimate of Harsha. Rajput Culture - Economic condition-Rajputs art and literature.
- Unit-II :** Delhi Sultanate- Impact of Islam on Hindu society - Administrative System of the Delhi Sultanate-Socio-Economic conditions during the Delhi Sultanate Sufi and Bhakti Movement -Cultural developments - Kakatiyas - Administration - Socio-economic -Cultural contribution -Vijayanagara: Sources - Krishnadevaraya - Literature Socio-Economic Life and Administration-Art & Architecture. Fall of Vijayanagara- Bahmani's, Administrative System - Socio-Economic Conditions - The Qutbshahis of Golconda -Administration -Cultural contribution - Mughals Achievements of Babur. Reforms of Shershah Sur-Akbar - Land Revenue System, Mansabdari System, Religion and Reforms of Akbar-Mughal Administration - Art, Architecture and Literature in Mughal India. Socio-Economic conditions, Decline of Mughal Empire - Rise of Marathas: -Shivaji's Administration, Estimate of Shivaji - Asaf Jahis - Foundation of Hyderabad state - Socioeconomic conditions.
- Unit-III:** Western Impact on India, State and Society in the 19th Century Advent of Europeans - Social and Religious Reform Movements in India Low Caste protest movements in India - Role of Jotiraophule and Dr. B. R. Ambedkar - Growth of Political Consciousness: Birth of Indian National Congress: Indian National Movement Character and Major Trends-Moderates, Extremists - Revolutionary Terrorist and Gandhian Era -Indian Economy: Colonial Impact: Commercialization of agriculture plantations - The Drain theory -Decline of

handicraft, famines: famine relief - Introduction of Railways, Rise of Modern Industry in India.

## **SECTION – B-HISTORIOGRAPHY AND HISTORICAL METHOD**

Definition, Nature and Scope of Historiography - History and Relation with other Social Sciences - Causation - Objectivity - Generalization - Greco-Roman Historiography: Herodotus & Thucydides - Livy & Tacitus - Christian Historiography: St. Augustine -Arab Historiography: Ibn Khaldun - Modern Historiography: Voltaire, Edward Gibbon -Ranke - Toynbee - Karl Marx - Indian Historiography: Purana, Ithihasa Tradition in ancient India - Kautilya - Kalhana's contribution, Medieval Historiography - Ziauddin Barani, Ferishta, Abul Fazal - Colonial Historiography: Orientalist, Nationalist Schools - Marxist and Subaltern Historiography - Topic of Research and Selection criteria -Collection of sources - Internal and External Criticism -Synthesis •- Interpretation -Cauterization - Foot Notes and Bibliography.

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**HUMAN RESOURCE MANAGEMENT**  
**SYLLABUS**

**SECTION-A:**

Human Resource Management: Concept, Terms and Conditions of Employment .Strategic Human Resource and Competitive Advantage, Management Theory and Practice, Management Environment, Managerial Communications and Public Relations, Organizational Behavior. Aspects of Human Behavior and Personality, Individual Differences, Labor Legislations in India,-Factories Act, 1948, Mines ACT, 1952, Contract Labour, Act 1970, Minimum Wages Act 1948, Payment of Wages Act 1936, Payment of Bonus Act 1965, Employees Insurance, State Insurance Act 1948, Employees Provident Fund Act, 1952 & Family Pension Act 1971, Payment of Gratuity Act 1972, Maternity Benefit Act 1961,Industrial Policy Resolutions, Human Resource Development and Training and Development.

**SECTION-B:**

Importance of Social Science Research, Scientific Research., Selecting a problem, Hypothesis, Research Design, Survey Methods, Observation, Questionnaire, Interview Case study. Sampling Techniques, Scaling Techniques, Use of Computers. Classification of data, Frequency distribution. Tabulation methods. Diagrams, Graphs, pictogram & cartogram, Measures of central tendency, measures of dispersion, correlation, regression, analysis. Data Processing, Data Analysis and Research Report.

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**POLITICAL SCIENCE**  
**SYLLABUS**

1.   a. Thomas Hobbes : Theory of Individualism-Consent and Sovereignty-Philosophy and Science.  
      b. Rousseau : Property and Origin of Inequality — Concept of General will, Paradox of Freedom and Authority.  
      c. J.S. Mill : Utilitarianism - Concept of Liberty - Representative Government.  
      d. Karl Marx : Dialectical Materialism-Historical Materialism-Critique of Capitalism - Theory of Alienation - Concept of Man.
2.   a. Morgenthau's Realist Theory of International Politics.  
      b. Theories of Imperialism - Marxist and Non-Marxist.  
      c. Neo-Colonialism - International Politics - Non-alignment - Its growth-Characteristics and assessment - New International Economic Order (NIEO).
3.   a. Nature of Modern Political Theory - Normative and Behavioral approaches.  
      b. Systems Theory: Decision making theory: Communication and Game theories.  
      c. Structural - Functional Analysis.
4.   a. Theories of Political Development - Concept of Modernization and Nation building.  
      b. Theory of Elites - Political Culture - The role of values and attitudes in politics.  
      c. Political Participation - Theory and Practice.
5.   a. Social dimensions of Indian Politics - Role of Caste, Language, Religion and Regionalism in political processes.  
      b. Working of Federal Polity in India - Problems of Centralization - Demand for States autonomy.  
      c. Indian Experience with development and democracy - areas of performance and tensions.
6.   a. Political ideas of Arthasastra and Manusmriti.  
      b. Theories of the Origin of the State - Nature, Aims and Functions of the State in ancient India -Kingship.

**Model Question Paper**

Time : 3 Hours

Max. Marks : 100

<b>Section – A</b>
a) There shall be 14 short type questions and 10 questions should be answered for 50 marks (10 x 50=50), and
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b) There shall be 7 essay type questions and 5 questions should be answered for 50 marks (10 x 50=50), and
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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**PUBLIC ADMINISTRATION**  
**SYLLABUS**

**SECTION: A**

Administrative Theory, Political Theory, Public Policy, Management and Management Techniques ,Public Administration in India , Comparative Administration, Communications and Public Relations, Human Resource Management and HRD, Organizational Behavior, Global Organizations and Development, Financial Administration. Office Management.

**SECTION-B:**

Research Methodology in Social Sciences importance of Social Science research .objectivity in Social Science Research, Methods of Social Science research, Research Design, Selection of a Research topic, Hypothesis, Primary and Secondary Sources of data, Methods of data collection - survey & case study methods, questionnaire and interview methods, observation and participant observation methods , Statistical Tools - Sampling methods and scales of measurement. Classification of data - coding, Tabulation & presentation, Methods of Data analysis - Use of Computers in Research, Report Writing.

**Model Question Paper**

Time : 3 Hours

Max. Marks : 100

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**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
**Ph.D Entrance Test -2013**

**TOURISM MANAGEMENT**  
**SYLLABUS**

**SECTION - A - FUNDAMENTALS OF TOURISM**

- Unit-I :** Tourism-Definition-Meaning-Nature, Elements of Tourism, Significance of Tourism -Tourism through the Ages - Growth of Tourism in India and Abroad-Factors influencing growth of Tourism.
- Unit-II :** Transport, Accommodation and Tourism Marketing:  
Modes of Travel and Transport- Role of Transport in Tourism Development.  
- Accommodation: Various types of Accommodation, Hotels, Star Hotel, Heritage Hotels, Motels, Youth Hostels, Inns, Food and Beverages etc.  
- Tourism Marketing - Advertising, Promotion and Publicity- Role of Media, Various Types of Media and Media Research - The Concept of Marketing in Tourism-Marketing Research -Tour Packing and its Principles.
- Unit-III :** Travel Agency- Tourism, Travel Regulations and Organizations:  
-Travel Agency- Definition-Main Functions - Different Types of Travel Agencies Tour Operators & Their Responsibilities. Procedures for becoming a Travel Agent and Tour Operator in India, Guides and Escorts.  
-Tourism Regulations: Inbound, out bound Travel Regulations - Pass Port, Visa, Customs,  
Currency, Insurance, Health.  
-Organizations in Tourism Industry-The Role of National and International Tourism Organizations -ITDC, STDC, IATA, PATA, WTO etc.

**SECTION - B - RESEARCH METHODOLOGY**

- Unit-I :** Define Research and its Significance - Types of Research - Nature and Scope of Research in Tourism. Major Areas of Research in Travel and Tourism, Challenges and Strategies in Tourism Research - Contemporary Trends - Status of Tourism Research in India.
- Unit-II :** Research Design: Guiding Principles in Selection of Research Problems - Formulation of Hypothesis, Identifying the Objectives- Data Collection - Field Procedures: Techniques of Data Collection and their Evaluation: Observation Technique: Personal and Telephone Interviewing, Mail Survey, Questionnaire Method.
- Unit-III:** Research Methodology-Analysis of Data-Synthesis and Exposition - The Writing of Research Report- Short Reports- Long Reports- Research Report Format - Writing Considerations, Bibliography, Footnotes.

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**SOCIOLOGY**  
**SYLLABUS**

**I. PRINCIPLES OF SOCIOLOGY**

**UNIT-I:**

What is Sociology? (Definition, Nature, Scope, Emergence of Sociology, Methods of Sociology). Why Sociology? (Importance and Applications of Sociology). Sociology and other social Sciences (Social Anthropology, Political Science, Economics, History, Psychology).

**UNIT-II:**

Basic concepts Society - Its Nature, Characteristics, Functions and Theories, Types of Society -Tribal Agrarian, - Rural-Urban industrial and post industrial. Influence of heredity and environment on Personality Development Community - Association - Culture, Social Groups - Classification of social groups - Elements of social structure and social system - Role, Status, Values, Norms.

**UNIT-III:**

Socialization - Significant, Theories and Agencies. Social Control -Conformity and Deviance -Means and agencies of Social Control. Social Interaction - Social Process - Associative and Disassociate.

**UNIT-IV:**

Social Institutions: Marriage, Family, Kinship, Education and Religion. Economy - Concept of property, Economic Systems of simple and complex societies, free market and planned economy. Polity - power, Authority and Legitimacy, Political Socialization and Modernization; pressure groups.

**UNIT -V:**

Social Stratification and Mobility - Forms and Functions - Caste, Class, and Estate - Theories of Social stratification. Social Change - Theories and Factors of Social Change.

## **II. CLASSICAL SOCIOLOGICAL THINKERS**

### **UNIT-I:**

August Comte - Sociology and Social Sciences, Law of Three Stages, Social Change, Industrial Society - Positivism. Herbert Spencer - Evolution and Organismic Theory of Society. Typology of Societies - Functionalism.

### **UNIT-II:**

Vilfredo Pareto - Logical and non-logical action. Residues and derivatives. Elements of society. General form of society. Cycles of change: Circulation of Elites; Political and Economic.

### **UNIT-III:**

Karl Marx - Nature of Social Reality, Materialist Conception of history and society. Society, Social Relations and Economic Structure, Modes of Production and Types. Marx's Concept of Alienation, Capitalism, Ideology, Social Classes, Class domination, Class consciousness, Class conflict.

### **UNIT-IV:**

Emile Durkheim - Rules of Sociological Method: Social Facts, Objectivity, normal and Pathological, Sociological explanation and proof. Division of Labour; Dynamic density, Law, Anomie, Social solidarity; Mechanical and Organic. Collective consciousness Forms of Division of labour. Elementary forms of Religious life: Nature of Religion, Sacred and Profane. Totemism; Believes, Rites. Suicide; Types and Causes; Suicide and Social Structure.

### **UNIT -V :**

Max Weber - Social Action, Types of meaningful action Verstehen causality Ideal type. Values; Value relevance, Value reference, Value judgment, Social Action - Typology of Social Action -Power-, -Domination, Authority, Legitimacy - Types of Domination, Class Status, Party and Market life styles, Life chances Capitalism; Weber's Protestant Ethic thesis and world religious History Rationalization Disenhancement.

## **III. MODERN SOCIOLOGICAL THEORIES**

### **UNIT-I:**

Karl Manhiem - The Sociology of Knowledge, Sociology and its Methodology: The Process of Democratization - Planned Reconstruction of Society,

Demographic Planning. George Simmel-Methodology, Group Conflict, Philosophy of Money.

#### **UNIT-II:**

Talcott Parsons - General Theory of Action, Functional Imperatives, Pattern Variables, Social System. Robert K. Merton - Theory and Empiricism, Functional Analysis, Middle Range Theories, Social Structure and Anomie.

#### **UNIT-III:**

C.W.Mills - Sociological Imagination, Stratification, Class, Power Elite Anthony Giddens-Structure, Agency, Structuration Theory and Modernity.

#### **UNIT-IV:**

Social Exchange Theory-Romans, Blau Symbolic Interactionism -GH.Mead, Blumer, Kuhn

#### **UNIT -V:**

Ethnomethodology & Phenomenology - Goffman, Garfinkel, Husserl, Schultz..

### **IV. RESEARCH METHODOLOGY AND SOCIAL STATISTICS**

#### **Unit -I:**

Sociology as a science and Social research - Theory and Research -Hypothesis Concepts - Construct values - Major steps in Social Research - Data collection - Analysis - Report Writing.

#### **Unit -II:**

Quantitative and Qualitative Research - Research Design - Aims and Importance - Types of Research Design - Exploratory Design - Descriptive Design - Experimental design.

#### **Unit -III:**

Sampling - Sample Design - Probability and Non - Probability SamplingSampling Errors- Methods of Data Collection - Observation - Interview Schedule - Questionnaire - Social survey - Case Study.

#### **Unit -IV:**

Importance of Statistics - Grouping of Data - Formation of frequency Distribution Tables -Diagrammatic and Graphic Representation - Measures of central tendency Arithmetic mean •- Median - Mode - Measures of Dispersion -Standard Deviation.

#### **Unit -V:**

Measures of association Coefficient of Correlation & Chi-square.

### **V. SOCIAL STRATIFICATION AND SOCIAL MOBILITY**

#### **Unit -I:**

Social Differentiation and Social Stratification-Attributes of Social Stratification-Dimensions of Stratification. Perspectives and Concepts in the study of Social Stratification and Social Mobility. Social inequality in historical and contemporary contexts-indices of inequality-life chances and life styles. Principal types of stratification systems: Caste, Class, Estate and Gender.

#### **Unit- II: Theoretical Perspectives:**

- (a) Contributions of Karl Marx and Max Weber to the understanding of Social Stratification
- (b) Functional theory of stratification (Davis-Moor's theories)
- (c) Parson's theory of stratification
- (d) Lenski's theory of stratification.

#### **Unit- III:**

- (a) Caste system in India. Present situation of caste in rural and urban areas.
- (b) Class-definition of class-classes in industrial and economically developing societies.

#### **Unit- IV:**

Relationship between social stratification and mobility. Types of social mobility-Social and Occupational Mobility, Gender and Social Mobility Factors of mobility.

#### **Unit V:**

Reference Group Theory and Mobility Sanskritization and De-sanskritization, Modernization, Westernization and Islamization . Elites in India-Social Mobility trends in rural and urban India. Constraints to Mobility in India.

## **VI. RURAL AND URBAN SOCIOLOGY**

### **Unit- I:**

Nature and scope of rural and urban sociology - Rural and Urban Society Characteristics - Rural Urban differences and continuum - Notion of village -City - Agriculture and Industrial Revolution-Causes of Urbanization and Relation between urbanization and Industrialization.

### **Unit- II:**

Social structure of rural Communities-Caste and Jati-Caste in contemporary India - Jati -Inter and intra caste relationship -Major theoretical perspectives in urban sociology- Patterns of Urban growth Urban ecology-Concentric Zone theory-Hoyt's sector theory Multiple nuclei theory -Central place theory - Urbanism as way of life.

### **Unit- III:**

Rural economy in India-Jajmani system-Rural development programmes in India-Rural unrest-Green Revolution-Sustainable and non-sustainable development-Urbanization and migration-Urbanization and development-the cultural role of cities- Social consequences of urbanization-Changes in urban social life in the context of Globalization.

### **Unit -IV:**

Village governance pre and post independence - Panchayati Raj PR.Institutions and their impact on rural India-Land Reforms in India Social change in Village India.

### **Unit-V:**

City planning-practices and problems-Urban Problems-Education -health - Unemployment-environment-pollution-National urbanization policy in India.

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**Civil Engineering**  
**SYLLABUS**

**STRUCTURAL ENGINEERING:**

**Engineering Mechanics:**

Concurrent, Non Concurrent and parallel forces in a plane, conditions of equilibrium, Principle of virtual work, Area and Mass moment of Inertia, Static Friction, Kinematics and Kinetics of particle and rigid bodies.

**Strength of Materials:**

Simple Stress and Strain, Elastic constants, Shear force and bending moment, theory of simple bending, Shear Stress, Deflection of beams, Torsion of Shafts, Columns

**Structural Analysis:**

Castigliano's theorems I and II, Slope deflection, moment distribution, Rolling loads and Influences lines, Three hinged, two hinged arches, Matrix methods of analysis, Plastic Analysis of beams and frames- Finite Element Analysis- Theory of Elasticity and Plasticity- Structural dynamics

**Structural Steel Design:**

Riveted, bolted and welded joints, Design of tension and compression member, beams of built up section, plate girders, gantry girders, Trusses

**Design of Concrete Structures:**

Reinforced Concrete: Working Stress and Limit State method of design-Design of one way and two way slabs, stair-case, simple and continuous beams of rectangular, T and L sections, Columns and footings, Retaining walls. Water tanks, Redistribution of moments -Limit state of serviceability -Ductility considerations in Earthquake Resistant Design of Structures- Prestressed concrete- Composite materials

## **GEOTECHNICAL ENGINEERING**

**Soil Mechanics:** Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships, permeability & seepage, effective stress principle, consolidation, compaction, shear strength.

**Foundation Engineering:** Sub-surface investigations. Earth pressure theories, effect of water table, layered soils. Stability of slopes. Foundation types- foundation design requirements. Shallow foundations and Deep foundations.

## **WATER RESOURCES and ENVIRONMENTAL ENGINEERING**

**Fluid Mechanics:** Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations, potential flow, applications of momentum and Bernoulli's equation

**Water Resources:** Duty-Delta, Hydrograph, Irrigation channel hydraulics- Hydro power

**Environmental Engg:** Water supply and sanitary aspects- Quality and quantity assessment.

## **TRANSPORTATION ENGINEERING**

**Highway Planning:** Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

**Traffic Engineering:** Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway-capacity.

**KAKATIYA UNIVERSITY, WARANGAL, (AP)**  
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**COMPUTER SCIENCE / INFORMATICS**  
**SYLLABUS**

**1. Programming and Data Structures:**

Problem solving steps, Algorithm, flowchart, C++ Programming Language: Program structure, data types, Control Statements, Functions, Structures, union and files, pointers in C++, Simple and abstract data types, Inheritance and Aggregation, Exceptional Handling. Data structures: stacks, queues, linked list, Trees balanced trees, Graphs. Advanced Sorting Concepts - Insertion Sorts, Selection Sorts Exchange Sorts - External Sorts. Algorithm Design Techniques Greedy Algorithms, Divide and Conquer, Dynamic Programming - Ordering Matrix Multiplications - Backtracking Algorithms

**2. Mathematical Foundations of Computer Science:**

Sets, Relations and functions, Fundamental of logic, Logical inferences, First order logic, Quantified propositions, Mathematical induction, Combinations and Permutations, Enumeration- with Repetitions, with constrained repetitions, The Principle of Inclusion-Exclusion. Recurrence Relations Generating functions, Coefficients of Generating functions, Recurrence Relations, Inhomogeneous Recurrence Relations Relations and diagrams, Binary relations, Equivalence relations, Ordering relations, Lattices, Paths and Closures, Directed graphs, Adjacency matrices, Applications, Sorting and Searching GRAPHS: Graphs, Isomorphism, Trees, Spanning trees, Binary trees, Planar graphs, Euler Circuits, Hamiltonian graphs, Chromatic numbers, Four-colour problem, Network flows

**3. Computer Organization and Architecture:**

Logic Circuit, Basic structure of Computer, Hardware and Software Functional units, Basic operational concepts, Bus structures, Addressing Methods Processing Methods, Execution of a Complete Instruction, Hardwired Control, Performance Considerations, Micro Programmed Control, Input output Organization, Interrupts, Processor Examples, Direct Memory Access, I/O Hardware, Standard I/O Interfaces, The Motorola 680X0 Family, The Intel, MEMORY-Semiconductor, RAM, ROM, Cache Memories, Performance Considerations, - Virtual Memory, Memory Management.

#### **4. Computer Networks:**

Evolution of Data Communication and Networks, Transmission fundamentals, signals, media, encoding and modulation, switching techniques Internet works, OSI Model, Interfaces and modems, multiplexing, Error Detection and Correction, ISDN, networking and Internet Working Devices, Routing Algorithms, TCP/IP, UDP, Encryption/decryption, Authentication, Data Compression. Confidentiality using conventional Encryption, Traffic Confidentiality, Random Number Generation.· Cryptography: Principles of Public-Key Cryptosystems, the RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography, Message authentication Functions.

#### **5. Operating Systems:**

Process, CPU scheduling, Process synchronization, deadlocks, memory management, file system interface I/o systems Distributed systems communication, synchronization, deadlocks, file systems, shared memory Unix Utilities, Unix Internals, Unix process, Threads and signals and Inter Process Communication.

#### **6. Data Base Management Systems& Data Mining:**

DBMS: File systems, data models, Relational algebra and calculus, Query optimization and evaluation, Database design, Concurrency control and recovery, Storing and Indexing, Distributed data base design, Distributed Transaction Management, Reliability.

#### **7. Software Engineering:**

Generic View of Process, Process models, Software requirement engineering, system engineering, Design Engineering, Object-oriented Design, user interface design, software configuration management, Testing Strategies and methods, clear room software design.