B.Sc Semester III Chemistry Paper I P C 3004

Inorganic Chemistry

Scheme of examination: *MM: 23*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

Chemistry of Elements of First Transition Series: Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Unit-II

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

Unit-III

Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds.

Unit-IV

Oxidation and Reduction

Use of redox potential data-analysis of redox cycle, redox stability in water-Frost, Latimer and Pourbaix diagrams.

Unit-V

Non-aqueous Solvents

Physical properties of a solvent, types of solvents and their general

characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

B.Sc Semester III Chemistry Paper II P C 3005

Organic Chemistry

Scheme of examination: *MM: 23*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

Electromagnetic Spectrum : An introduction

Absorption Spectra-I : Ultraviolet (UV) absorption spectroscopy - absorption laws (Beer Lamber law) molar absorptivity, presentation and analysis o UV spectra, types of electronic transitions, effect of solvent on transitions, effect of conjugation, concept of chromophore and auxochrome Bathochromic, hypsochromic and hyperchromic and hypochromic shifts, UV spectra and conjugated enes and enones.

UNIT – II

Absorption spectra – II:

Infrared IR absorption spectroscopy - molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

UNIT – III

Alcohols: Classification and nomenclature.

Monhydric Alcohols : Methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters, Hydrogen bonding Acidic nature, Reactions of alcohols.

Dihydric Alcohols : Methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol pinacolone rearrangement.

Trihydric alcohols : Methods of formation, chemicals reactions of glycerol.

Unit-IV

Phenols: Nomenclature, structure and bonding, Preparation of Phenols, Physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion reactions of phenols electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement. Gatterman synthesis, Hauben-Hoesch reaction, Leader manasse reaction and Reimer Tiemann reaction.

UNIT - V

Ethers and Epoxides: Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions, cleavage and autoxidation, Ziesels' method.

Synthesis of epoxides. Acid and base-catalyed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithim reagents with epoxides.

B.Sc Semester III Chemistry Paper III P C 3006

Physical Chemistry

Scheme of examination: *MM: 24*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

Thermodynamics-I: Definition of theromdynamic terms : System, surroundings etc. Types of systems intensive and extensive properties. State and path functions and their differentials. Thermodynamics process, concept of heat and work.

First Law of Thermodynamics : Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law- Joule - Thomson coefficient and inversion temperature, calculation of w, q, dU & dH for the expansion of ideal gases under isothermal nad adiabatic condition for reversible process.

UNIT - II

Thermochemistry: Standard state, standard enthalpy of formation Hess's law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit-III

Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction isotherm and reaction isochore-Clapeyron equation and Clausius. Clapeyron equation, applications.

Phase Equilibrium –I: Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilbria of one component system- water, CO_2 and S systems phase equilibria of two component system - solid - liquid equilibria, simple eutectic Bo - Cd, Pb-Ag systems, desilverisation of lead.

UNIT – IV

Electrochemistry-I: Electrical transport - conduction inmetals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohalrausch law,

Electrochemistry-II: Applications of conductivity measurements : Determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titerations.

UNIT V

Electrochemistry-III: Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald's dilution law its uses and limitations, Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

Inorganic Chemistry

Scheme of examination: *MM: 23*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

VBT of transition metal complexes, formation of octahedral complexes based on VBT, outer orbital and inner orbital complexes, formation of tetrahedral a square planar complexes based VBT, Limitations of VBT.

UNIT II

Acid and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

UNIT III

Lanthanide: Electronic structure, oxidation state and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

UNIT IV

General features and chemistry of actinides, similarities between the later actinides and the later lanthanides super heavy elements.

UNIT V

Principles involved in extraction of elements, chemistry of separation of Np, Pu and Am from U.

B.Sc Semester IV Chemistry Paper II P C 4005

Organic Chemistry

Scheme of examination: *MM: 23*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Keoevengel condensations, Condensations with ammonia and its derivatives. Witting reaction, Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, clemmensen, Wolf-Kishner, $LiAl_4$ and $NaBH_4$ reductions, Halogenation of enolizable ketones.

UNIT II

Carboxylic Acid – I: Nomenclature, structure and bonding, Physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, Reactions of Carboxylic acids Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides, reduction of carboxylic acids, Mechanism of decarboyxlation. Methods of formation and chemical reactions of halo acids. Hydroxy acid; malic, tartaric and citric acids.

Methods of formation and chemical reactions of α, β – unsaturated monocarboxylic acid.

Carboxylic acid-II: Dicarboxylic acid: Methods of formation and effect of heat and dehydration agents (Succinic, Glutaric and Adipic acids.).

UNIT III

Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides, Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation f carboxylic acid derivatives, chemical reactions, Mechanisms of esterification and hydrolysis (acidic and basic).

UNIT IV

Organic Compounds of Nitrogen: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkenes, Mechanisms of nucleophilic substitution in nitro arenes and their reductions in acidic, neutral and alkaline media, Picric acid.

UNIT V

Halonitroarenes: Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrides), reductive amination of aldehydeic and ketonic compounds. Gabriel - phthalimide reaction, Hofmann bromide reaction.

Reaction of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Diazotisation mechanism. Synthetic transformation of aryl diazonium salts, azo coupling.

B.Sc Semester IV Chemistry Paper III P C 4006

Physical Chemistry

Scheme of examination: *MM: 24*

1 *In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.*

UNIT – I

Thermodynamics-II: Second Law of Thermodynamics: Need for the law, different statement of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

Concept of Entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium, Entropy change in ideal gases and mixing of gases.

UNIT II

Thermodynamics-III: Third law of thermodynamics: Nernest heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) Thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, Variation of G and A with P, v and T.

UNIT III

Phase Equilibrium – II: Solid solutions - compound formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H_2O), ($FeCl_3$ - H_2O) and $CuSO_4$-H_2O system, Freezing mixtures, acetone-dry ice.

Liquid-liquid mixtures - Ideal liquid mixtures, Raoult's and Henry's law, Non-ideal system-azeotropes - HCl-H_2O and ethanol water systems.

Partially miscible liquids: Phenol- water, trimethylamine -water nicotine water systems, Lower and upper consolute temperature, Effect of impurity on consolute temperature.

Immiscible liquids, steam distillation.

Nernst distribution law-thermodynamic derivation, applications.

UNIT IV

Electrochemistry-IV: Types of reversible electrodes - gas - metal ion, metal -metal ion, metal-insoluble salt-anion and redox electrodes, Electrode reactions, Nernst equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells - reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements, computation of cell EMF.

Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), polarization, cover potential and hydrogen overvoltage.

UNIT V

Concentration cell with and witout transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and pK_a, determination of pH using hydrogen quinhydrone and glass electrodes, by potentiometric methods.

B.Sc Semester III Physics Paper I P C 3011

STATISTICAL AND THERMODYNAMICAL PHYSICS – I

Scheme of examination: *MM: 23*

1. ***In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.***

UNIT-I

First law of Thermodynamics: Microstates of the system Thermal interaction, Thermal insulation, Adiabatic interaction and Enthalpy, Concept of temperature and Zeroth law of Thermodynamics, idea of temperature scales, thermodynamical parameter β, distribution of energy, first law of thermodynamics.

UNIT-II

Second law of Thermodynamics and Heat Engines: Second law of thermodynamics (Different statements and their equivalence). System in contact with a heat reservoir (Canonical distribution). Partition function. Reversible and irreversible processes,. Heat engines, Carnot cycle, Carnot's ideal Engine and Refrigerator. Thermodynamical scale as an absolute scale.

UNIT-III

General Thermodynamics Interactions: Dependence of number of states on External parameters, General relations in equilibrium, equilibrium conditions. Infinitesimal quasitstatic process, entropy of an ideal gas, equilibrium of an isolated system, equilibrium of system in contact with a reservoir (Gibb's free energy).

Incharge
Deptt. of Physics
R R College, ALWAR

UNIT-IV

Thermodynamic Relation: Equilibrium between phases, Clausius Clapeyron equation. Triple point, vapour pressure in equilibrium with a liquid or solid, equilibrium condition for a system of fixed volume in contact with heat reservoir (Helmoholtz free energy). Deduction of Maxwell's relation and their applications.

-----X-----

Incharge
Deptt. of Physics
R. R College, ALWAR

OPTICS – I

Scheme of examination: *MM: 23*

1. *In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

UNIT-I

Elements of Geometrical Optics: Fermat's principle, laws of reflection and refraction from Fermat's principle, Refraction at a spherical surface, Linear and lateral magnifications, Refraction through a thick lens. Focal lengths of thick and thin lenses. Combination of two lenses. Cardinal points.

UNIT-II

Interference: Superposition of waves from two point sources, necessity of coherence, Concept of spatial and temporal coherence. Effective size of a point source. Shape of interference fringes. Intensity distribution in space. Interference by division of amplitude, Interference in thin films. Colours of thin films in transmitted and reflected light.

UNIT-III

Application of Interference: Newton's Rings. Michelson's interferometer, Fringes of different shapes with Michelson's interferometer, Determination of wave length with Michelson's interferometer. Determination of refractive index by Newton's ring and Michelson interferometer.

UNIT-IV

Laser and Holography: Spontaneous and stimulated emission, Einstein's coefficient, **Energy density** of radiation as a result of stimulated emission

Incharge
Deptt. of Physics
P. P. College

and absorption, Population inversion, Methods of optical pumping, energy level schemes and working of He-Ne, Ruby and CO_2 laser. Basic concept of Holography, construction of hologram and reconstruction of the images.

-----X-----

Incharge
Deptt. of Physics

ELECTRONICS – I

Scheme of examination: *MM: 24*

1. ***In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.***

UNIT-I

Circuit Analysis: Network's – some important definition, loop and nodal equations based on DC and AC circuit.

Kirchhof's Laws. Four terminal network Ampere-Volt conventions, open, close and Hybrid parameter of any four terminal network.

Network Theorems: Superposition. Thevenin, Norton and Reciprocity, Compensation, Maximum power transfer.

UNIT-II

Semiconductor and Semiconductor diodes: Energy band in solids. Intrinsic and extrinsic semiconductors, charge densities in N and P materials. Conduction by drift and diffusion of charge. P-N junction diode equation, capacitance effect. P-N junction and Zener Diode and their I-V characteristics.

UNIT-III

Rectifiers and Power supplies: Diode as a rectifier, Half-wave full wave and Bridge rectifiers, calculation of ripple factor, efficiency and regulation.

Filters: Series Inductor, Shunt Capacitor, L-Section and π-section filters,

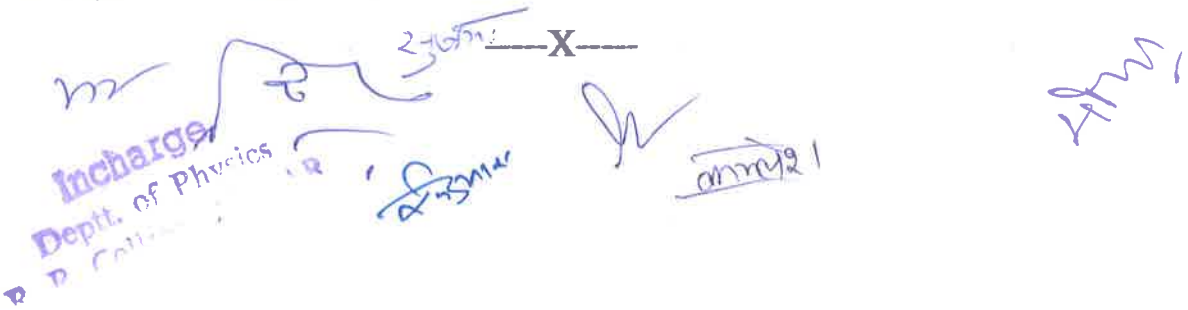
Voltage regulation: Voltage regulation and voltage stabilization by Zener diode. Voltage multiplier.

Incharge
Deptt. of Physics
R. R College

UNIT-IV

Transistor and Transistor Amplifiers: Notation and volt ampere characteristics for bipolar junction transistors. Concept of load line and operating point, Hybrid parameter, CB, CE, CC configurations. Analysis of transistor amplifiers using hybrid parameters and its gain, frequency response. Stability factors, various types of bias circuits for thermal bias stability, Fixed bias, collector to base feed back bias and four resistor bias.

----X----



STATISTICAL AND THERMODYNAMICAL PHYSICS - II

Scheme of examination: *MM: 23*

1. *In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

UNIT-I

Production of low temperatures and applications: Joule Thompson expansion and J-T coefficients for ideal as well as Vander Wall's gas, porous plug experiment. Temperature inversion, regenerative cooling and cooling by Adiabatic expansion and demagnetization, liquid Helium, He-I and He-II, Super fluidity, refrigeration through Helium dilution quest for absolute zero, Nernst heat theorm.

UNIT II

The Distribution of Molecular Velocities : The distribution of molecular velocities, most probable, average and RMS velocities, the energy distribution function, effusion of molecular beam, experimental verification of Maxwell velocity distribution, The principle of equipartition of energy. Mean free path, distribution of free paths.

Transport phenomenon; coefficients of viscosity. Thermal conductivity. Diffusion and their interrelation.

UNIT III

Classical Statistics: Validity of classical approximation, phase space, Micro and Macro State, Thermodynamical probability, Relation between

Incharge
Deptt. of Physics
R. College

entropy and thermodynamical probability, The monoatomic ideal gas, the barometric equation, specific heat capacity of diatomic gas, specific heat capacity of solids.

UNIT IV

Quantum Statistics: Black body radiation and failure of classical statistics.

Postulates of quantum statistics, in distinguishability, wave function, exchange degeneracy, a priori-probability. Bose Einstein's Statistics and its distribution function. Planck's distribution function and radiation formula, Fermi-Dirac statistics and its distribution function, Contact potential. Thermionic emission, specific heat anomaly of metals, nuclear spin statistics (para and ortho hydrogen).

----X----

Incharge
Deptt. of Physics
R. R. College

OPTICS - II

Scheme of examination: *MM: 23*

1. *In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

UNIT-I

Diffraction: Fresnel's class of diffraction: Fresnel's assumptions, Half period zones, Zone Plate, phase reversal zone plate diffraction by a circular aperture, straight edge, a thin wire and rectangular slit. Cornu's spiral to study Fresnel's differection.

UNIT II

Fraunhofer class of diffraction: Fraunhoffer diffraction by single slit and a circular aperture, Fraunhoffer diffraction by N parallel slits with two slits as an application, Missing order, Plane diffraction grating, Dispersion by a grating, Rayleight's criterion of resolution, Resolving power of grating.

UNIT III

Polarization: Plane electromagnetic waves E and B of linearly, circularly and elliptically polarized electromagnetic waves. Reflection and refraction of plane EM Waves at a plane dielectric surface, Boundary conditions, Derivation of Fresnel's relation. Polarisation by reflection. Propogation of EM wave in an anisotropic media.

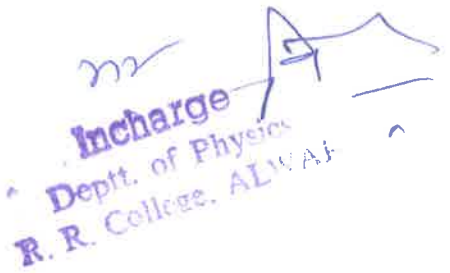
UNIT IV

Double refraction and optical activity: Huygen's Theory of Double Refraction using Fresnel Ellipsoidal Surfaces (no mathematical derivation), Production and Analysis of Plane Polarized, Circularly and elliptically

Deptt. of Physics
R. R. College, ALWAR

polarized light, Quarter and half wave plates. Specific Rotation. Bi-quartz and half shade polarimeters.

-----X-----



ELECTRONICS - II

Scheme of examination: *MM: 24*

1. *In all five questions are to be answered. There shall be two questions from each unit. A student has to answer one question from each unit. Fifth question will be compulsory and will cover the entire syllabus.*

UNIT-I

Amplifier with Feed Back: Concept of feed back, Positive and negative feed back. Voltage and current feed back circuits. Advantage of negative feed back. Stabilization of gain, effect of negative feed back on output and input resistance, reduction of nonlinear distortion, effect on gain - frequency response.

UNIT II

Oscillators :Criterion for self excited and self sustained oscillations, circuit requirement for build up of oscillations, Basic transistor oscillator circuit and its analysis Colpitt's and Hartely oscillators, R.C. Oscillators, Crystal oscillators and its advantages.

UNIT III

Field Effect transistor: Junction Field effect transistors (JFET) Metal Oxide Semiconductor Field Effect Transistor (MOSFET), circuit symbols, biasing, volt-ampere characteristics, Source follower operation of JEFT, FET as variable voltage resister.

UNIT IV

Digital Circuits: Binary number system, Binary arithmetic. Logic fundamental AND, OR, NOT, NOR, NAND, XOR. Boolean algebra,

Simplification of Boolean expressions. De Morgan's theorems. Positive and negative logic. Logic gate realization using DTL and TTL.

-----X-----

B.Sc (Hons.) Semester III Maths Paper I P C 3020

REAL ANALYSIS

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Real numbers as complete ordered field, Propecties of continuous function on closed intervals

UNIT – II

Limit point, Bolzano-Weierstrass theorem, Closed and Open sets, Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets. Properties of derivable function, Darboux's and Rolle's theorem.

UNIT – III

Real sequences - Limit and Convergence of a sequence, Monotonic sequences.

UNIT – IV

Cauchy's sequences, Subsequences, Cauchy's general principle of convergence. Notion of limit and continuity for functions of two variables.

B.Sc (Hons.) Semester III Maths Paper II P C 3021

DIFFERENTIAL EQUATIONS

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form.

UNIT – II

Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact. First order but higher degree differential equations solvable for x, y and p.

UNIT – III

Clairaut's form and singular solutions with extraneous Loci. Linear differential equations with constant coefficients. Complimentary function and particular integral.

UNIT – IV

Homogenous linear differential equations, Exact linear differential equations of nth order.

B.Sc (Hons.) Semester III Maths Paper III P C 3022

NUMERICAL ANALYSIS - I

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Differences. Relation between difference and derivatives Differences of a polynomial. Factorial function.

UNIT – II

Newton's formulae for forward and backward interpolation. Divided differences. Newton's divided differences, Interpolation formula. Lagrange's interpolation formula.

UNIT – III

Central differences. Gauss's Stirling's and Bessel's interpolation formulae. Numerical differences. Derivatives from interpolation formulae.

UNIT – IV

Numerical integration, Newton- Cote's formula, Trapazoidal rule, Simpson's one-third, Simpson's three-eighth and Gauss's quadrature formulae.

B.Sc (Hons.) Semester III Maths Paper IV P C 3023

OPERATIONS RESEARCH

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Assignment models, Mathematical formulation, Hungarian method, Variations of the assignment problem. Travelling salesman problem.

UNIT – II

Transportation models - Mathematical formulation, Initial basic feasible solution, Transportation algorithm for minimization problem, Degeneracy and unbalanced transportation problems.

UNIT – III

Theory of Games - Introduction, Basic definitions, Minimax (Maximin) criterion and optimal strategy, Saddle point, Minimax-Maximin principle for mixed strategy games. Inventory Models - Definition, Types of inventory models.

UNIT – IV

Fundamental theorem of game theory, Two-by-two games without saddle point, Arithmetic method for 2 X 2 games, graphical method for 2 X 2 games.

REAL ANALYSIS AND METRIC SPACE

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Riemann integration - Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

UNIT II

Sequence and series of functions - Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration. Metric space - Definition and examples.

UNIT III

Metric space, definition & simple properties of Open and Closed sets, Interior and Closure of a set, Limit point of a set. Subspace of a metric space, Product space.

UNIT IV

Continuous mappings, Sequence in a metric space, Cauchy sequence. Complete metric space, Baire's theorem, Compact sets and Compact spaces, Connected metric spaces.

B.Sc (Hons.) Semester IV Maths Paper II P C 4021

DIFFERENTIAL EQUATION - II

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators.

UNIT II

Method of variation of parameters, Method of undetermined coefficients. Partial differential equations of the first order. Lagrange's linear equation. Charpit's general method of solution.

UNIT III

Simultaneous differential equations. Existence and uniqueness theorem.

UNIT IV

Homogeneous and non-homogeneous linear partial differential equations with constant coefficients. Equations reducible to equations with constant coefficients.

B.Sc (Hons.) Semester IV Maths Paper III P C 4022

NUMERICAL ANALYSIS – II & VECTOR CALCULUS

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Numerical solution of algebraic and transcendental equations. Bisection method, Regula-Falsi method, Method of iteration, Newton-Raphson method.

UNIT II

Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic simultaneous equations. Solutions of ordinary differential equations of first order with initial and boundary conditions using Picard's and modified Euler's method.

UNIT III

Runge-Kutta method Scalar point function. Vector point function. Differentiation and integration of vector point functions. Directional derivative.

UNIT IV

Gradient, Divergence and Curl and identities involving there operators. Gauss divergence Theorems Green's and Stoke's Theorems (without proof) and their application.

OPERATIONS RESEARCH - II

Scheme of examination: MM: 70

Note: In all five questions are to be answered. First question will be short answer type, compulsory and will cover the entire syllabus. There shall be two questions from each unit. A student has to answer at least one question from each unit. All questions will carry equal marks.

UNIT – I

Measures of central Tendency, A.M., G.M., H.M., Median Mode

UNIT II

Probability theory - Probability distributions of a random variable, Standard deviation, Variance.

UNIT III

Mathematical expectation, Binomial, Poisson and Normal distributions.

UNIT IV

Queueing Theory - Introduction, Probability distributions in queueing systems. Models-Erlang model, general Erlang model, Model III(M/M/I): (N/FCFS).