For the Session 2022-23

B.Sc Semester III Chemistry Paper I

PAPER CODE 22-3004

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

PAPER CODE 22-3005

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.

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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

PAPER CODE 22-3006

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.

For the Session 2022-23

B.Sc Semester IV Chemistry Paper I

PAPER CODE 22-4064

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.

PAPER CODE 22-4005

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

PAPER CODE 22-4006

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.

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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.

For 2nd Session 2022-23

CHEMISTRY PRACTICAL B.Sc. PT-II

5 hrs. Duration

4 hrs./ week

Max. Marks: 100

PAPER CODE ...P-22-4004

Min. Marks: 36

Inorganic chemistry

(a) Estimation of hardness of water by EDTA.
(b) Estimation of ferrous and ferric by dichromate method.
(c) Estimation of copper using thiosulphate.

Gravimetric analysis

Analysis of Ba as BaSO4, Pb as PbCrO4, Ni as Ni DMG

Qualitative Analysis

Identification of an organic compound through the functional group analysis,determination of melting point and preparation of suitable derivatives.

Calibration of fractional weights pipettes and burettes.preparation of standard solutions.Dilutation-0.1 M to 0.001 M salutations.

Quantitative analysis

Volumetric analysis

(d) Determination of acetic acid commercial vinegar using NaOH
(e) Determination of alkali contacid tablet using HCl.
(f) Estimation of calcium in chalk as calcium oxalate by permanganmeter

Organic Chemistry

Laboratory Techniques

A. Thin layer chromatography

Dtermination of R_f values and identification of organic compounds.

(a) separation of green leaf pigments(spinach leaves may be used).
(b) Prepration and separation of 2,4- dinitrophenyhydrazones of acetone, 2-butanone ,hexan-2-and 3-one using toluene and light petroleum (40-60)
(c) Separation of a mixture of dayes using cyclohexane and ethyl acetate (8.5 : 1.5).

B. paper chromatography: ascending and circlar

Dtermination of R_f values and identification of organic compounds.

(a) separation of mixture of phenylalanine and glycine. Alanine and aspartic acid;leucine and glutamic acid. Spray regent-ninhydrin.
(b) separation of a mixture of DL-alanine, and L-lucine using n-butanol: acetic acid:water(4:1:5),spray regent-ninhydrin.
(c) separation of monosaccharides-a mixture of D-galactose and D fructose using n-butanol:water (4:5:1) spray reagent-aniline hydrogen phthalate.

Physical chemistry

1. Dtermination of the transition temprature of the given substance by thermometric/ dialometric method (e.g.$MnCl_24H_2O/SrBr_2H_2O$).

Phase Equilibrium

1. To study the effect of a solute (e.g.NaCl,succinic acid) on the crital solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of the solute in the given phenol –water system.
2. To construct the phase digram of two component (e.g. diphenylamine-benzophenone)system by cooling curve method.

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Thermochemestry

1. To determine the solubility of benzoic acid at different temperatures and to dtermine ? H of the dissolution process.
2. To determine the enthalpy of neutralization of a week acid/week base versus strong base/strong acid determine the enthalpy of ionization of the week acid/week base.
3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

PAPER CODE 22-3007

REAL ANALYSIS

Scheme of examination: **MM: 35**

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.

UNIT - I

Real number as complete ordered field, properties of continuous functions 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 functions, Darboux's and Rolle's theorem.

UNIT - III

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

UNIT - IV

Cauchy's sequence, Subsequence, cauchy's general principle of convergence. Notion of limit and continuity for functions of two variables

B.Sc Semester III Maths Paper II [redacted]

PAPER CODE 22-3008

DIFFERENTIAL EQUATIONS – I

Scheme of examination: **MM: 35**

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.

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 Semester III Maths Paper III

PAPER CODE 22-3009

NUMERICAL ANALYSIS-I

Scheme of examination: **MM: 35**

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.

UNIT - I

Differences. Relation between differences and derivatives. Differences of a polynomial.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

B.Sc Semester IV Maths Paper I

PAPER CODE 22-4007

REAL ANALYSIS AND METRIC SPACE

Scheme of examination: *MM: 35*

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.

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 – Point wise 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 Semester IV Maths Paper II

PAPER CODE 22-4008

DIFFERENTIAL EQUATIONS - II

Scheme of examination: *MM: 35*

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.

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 Semester IV Maths Paper III

PAPER CODE 22-4009

NUMERICAL ANALYSIS – II & VECTOR CALCULUS

Scheme of examination: *MM: 22*

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.

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, Curl and identities involving three operators. Gauss divergence theorems, Green's and Stokes theorems (without proof) their application.

B.Sc.Part-II Semester III PAPER CODE 22-3010

PHYSICS –I

Statistical and Thermodynamical Physics – I (MM33)

Note: 33 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**23 marks**

Duration : 3 hour

Note: - In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

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

UNIT – II

Second Law of Thermodynamics & Heat t Engines: Second law of thermodynamics (Different statement 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 Thermodynamic Interactions: Dependence of number of states on External parameters, General relations in equilibrium, equilibrium conditions, Infinitesimal quasistatic process, entropy of an ideal gas, equilibrium of an isolated system, equilibrium of system in contact with a reservoir (Gibb's free energy).

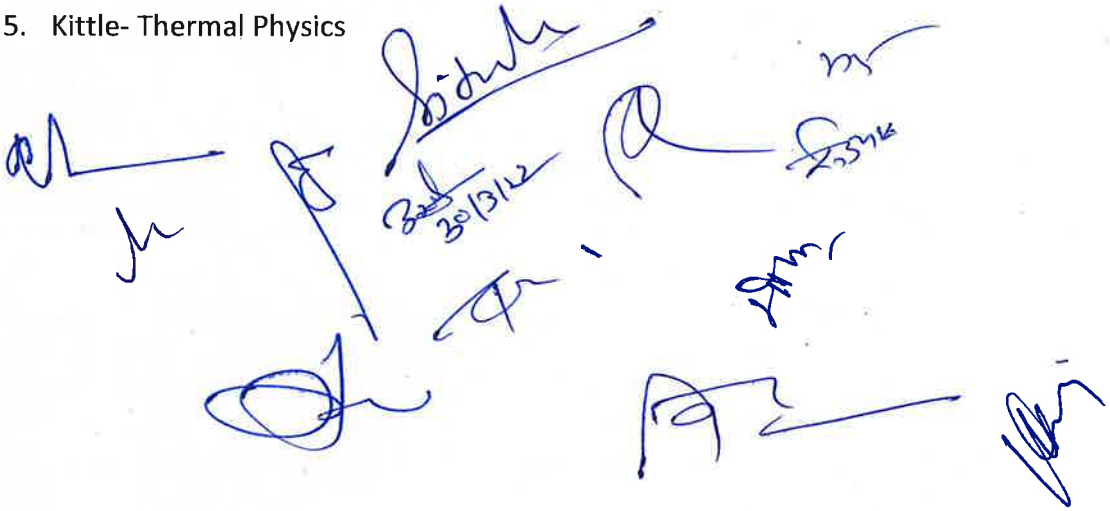
UNIT – V

Thermodynamic Relations: Equilibrium between phases, Clausius Clapeyron equation. Triple point, vapor pressure in equilibrium with a liquid or solid, equilibrium conditions for a system of fix volume in contact with heat reservoir (Helmholtz free energy). Deduction of Maxwell's relations and their applications.

30/3/22

Reference Books

1. Berkeley Series Vol V, Statistical Physics.
2. Reif- Thermodynamics and Statistical Physics
3. Loknathan and Khandelwal- Thermodynamics and Statistical Physics
4. Sears- Thermodynamics, Kinetic theory of gases and Statistical Physics
5. Kittle- Thermal Physics



PAPER CODE 22-3011

B.Sc.Part-II Semester III

PHYSICS-II

Mathematical Physics – I (MM33)

Note: 33 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**23 marks**

Duration : 3 hour

Note:- In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

Orthogonal Curvilinear Coordinate System: Orthogonal curvilinear coordinate systems, scale factors, expression for gradient, divergence, curl and their application to Cartesian, circular cylindrical and spherical polar coordinate.

UNIT – II

Tensors: Coordinate transformation and Jacobian, Transformation of covariant, Contravariant and mixed tensor. Addition, multiplication and contraction of tensors. Metric tensor and its use in transformation of tensors. Dirac Delta function and its properties.

UNIT – III

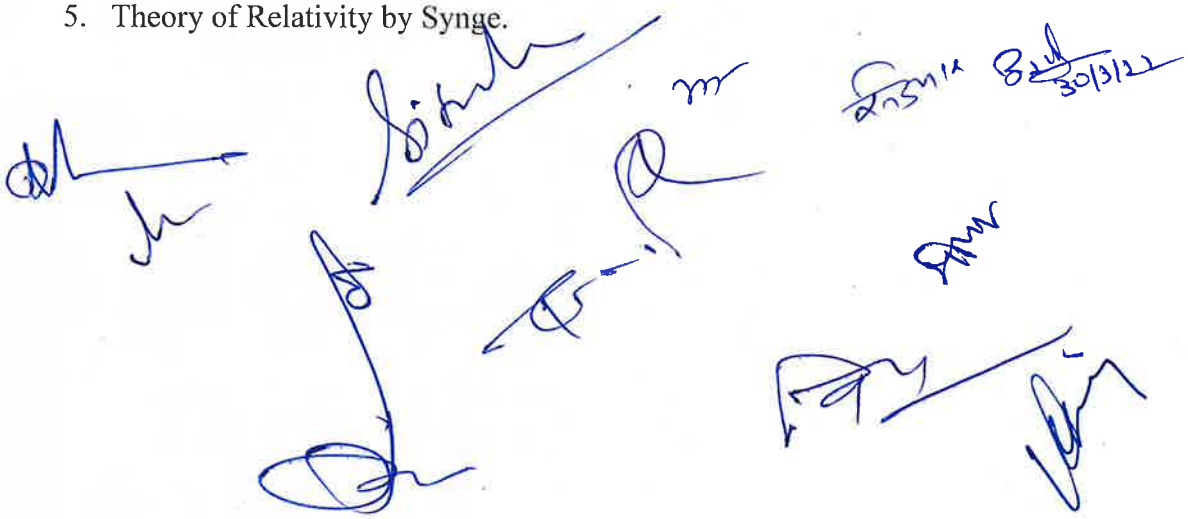
Four Vectors: Four vector formulation, energy-momentum four vector, Relativistic equation of motion, invariance of rest mass, Orthogonality of four force and four velocity, Lorentz force as an example of four force, Transformation of four frequency vector, Longitudinal and transverse Doppler's effect.

UNIT – IV

Relativistic Dynamics: Transformation between laboratory and center of mass system, four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds; Pair production, inelastic collision of two particles, Compton effect. Lorentz transformation and rotation in space-time like and space like vectors, world line, macro causality.

Reference Books

1. Mathematical methods for Physicists by George Arfken, Academic Press.
2. Applied Maths for engineers and Physicists by Pipes and Harvell (Mc Graw Hill).
3. Mathematical methods by Potter and Goldberg (Prentice Hall, India).
4. Special Relativity by A.P. French (English Language Book Society).
5. Theory of Relativity by Synge.



PAPER CODE 22-3012

B.Sc.Part-II Semester III

PHYSICS -III

Electronics – I (MM34)

Note: 34 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**24 marks**

Duration : 3 hour

Note:- In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

Circuit Analysis: Networks – Some important definition, loop and nodal equations based on DC and AC circuits. **Kirchhof's Laws -** Four terminal network Ampere-volt conventions, open, close and Hybrid parameters 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

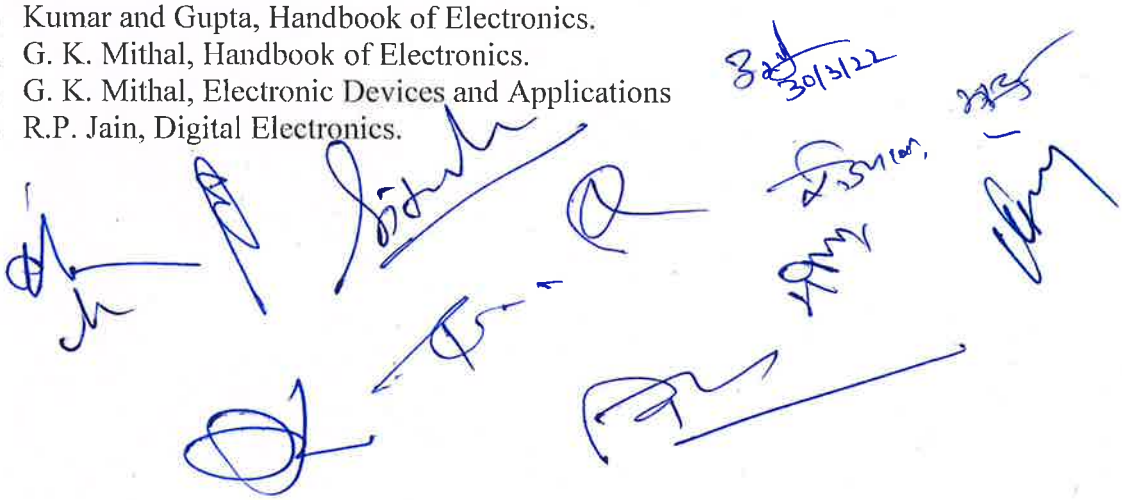
Rectifiers and Power Supplies: Diode as a rectifier, Halfwave, full wave and Bridge rectifiers, calculation of ripple factor, efficiency and regulation. **Filters** – Series inductor, Shunt Capacitor, L-section and π section filters. **Voltage Regulation –** Voltage regulation and voltage stabilization by Zener diode. Voltage multiplier.

UNIT – IV

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

Reference Books

1. John D. Ryder, Electronics Fundamentals and Aplications, Prentice Hall of India Pvt. Ltd., New Delhi.
2. John D. Ryder, Engineering Electronics, McGraw Hill Book Company, New Delhi.
3. Jacob Millman and Christoc Halkias, Integrated Electronics, Analog and Digital Circuits and Systems, McGraw Hill Ltd.
4. Albert Paul Malvino, Digital Computer Electronics, Tata McGraw Hill Pub. Co, Ltd.. New Delhi.
5. Kumar and Gupta, Handbook of Electronics.
6. G. K. Mithal, Handbook of Electronics.
7. G. K. Mithal, Electronic Devices and Applications
8. R.P. Jain, Digital Electronics.



PAPER CODE 22-4010 Paper-I

B.Sc.Part-II Semester IV

PHYSICS (401) Statistical and Thermodynamical Physics – II (MM33)

Note: 33 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**23 marks**

Duration : 3 hour

Note:- In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

Production of Low Temperatures and Applications: Joule Thomson 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 theorem.

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 phenomena; Coefficients of viscosity. Thermal conductivity. Diffusion and their interrelations.

UNIT – III

Classical Statistics: Validity of classical approximation, Phase space, Micro and macro state, Thermo dynamical probability, Relation between Entropy and Thermo dynamical probability, The monatomic ideal gas, the barometric equation, specific heat capacity of diatomic gas, Heat capacity of solids.

UNIT – IV

Quantum Statstics: Black body radiation and failure of classical statistics. Postulates of quantum statistics, indistinguishability, 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).

PAPER CODE 22-4011

B.Sc.Part-II Semester IV

PHYSICS-II

Mathematical Physics – II (MM33)

Note: 33 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**23 marks**

Duration : 3 hour

Note:- In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

Relativistic Electrodynamics: Law of conservation of charge and equation of continuity. Lorentz transformation of charge and current densities. Lorentz transformation of an electric field and Magnetic field. Description of Maxwell's equation in tensor form.

UNIT – II

Differential Equations of Second Order and Special Functions - 1: Linear differential equation with variable coefficient and singular points, series solution method and its application to the Legendre's differential equation. Rodrique's formula, Integral properties of Legendre polynomials, generating functions of $P_n(x)$, Recurrence relations of $P_n(x)$,Associated Legendre's polynomials graphical representations.

UNIT – III

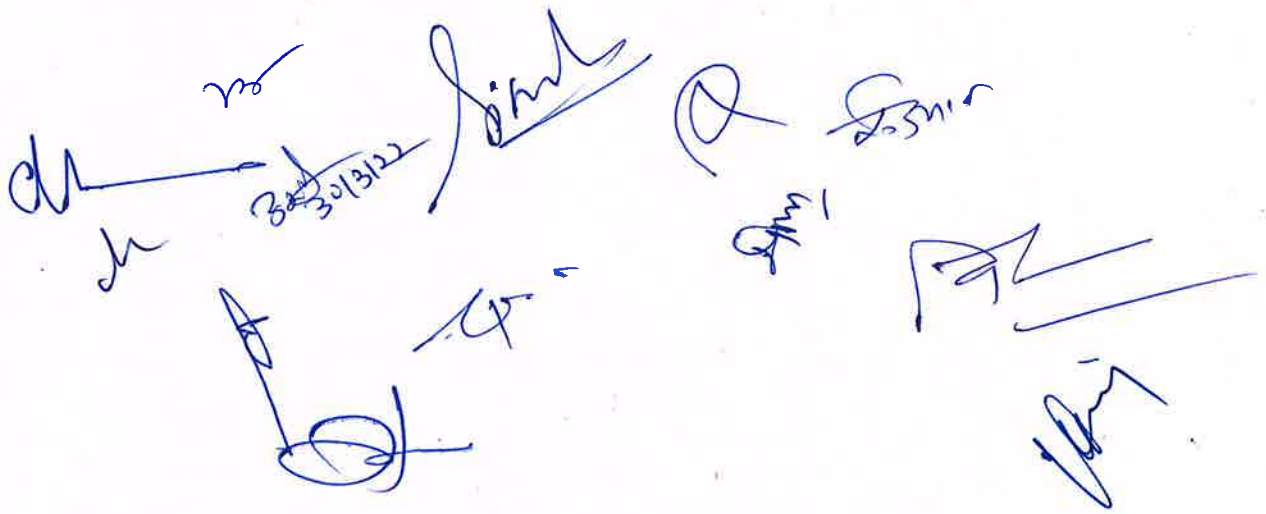
Differential Equations of Second Order and Special Functions -2 : Hermite differential equation, generating functions of $H_n(x)$, Recurrence relations of $H_n(x)$, Orthogonality relation for Hermite equation. Laguerre differential equation, generating functions of Leguerre polynomials, Recurrence relations of $L_n(x)$, Rodrique's formula for $L_n(x)$, Orthogonality relation for Laguerre polynomials. Associated Leguerre equation.

UNIT – IV

Boundary Value Problems: Techniques of separation of variables and its application to following boundary value problem (i) Laplace equation in three dimension Cartesian coordinate system-line charge between two earthed parallel plates, (ii) Helmholtz equation in circular cylindrical coordinates – Cylindrical resonant cavity. (iii) Wave equation in Spherical Polar coordinates - vibration of a circular membrane (iv) Diffusion equation in two dimensional Cartesian coordinate system – Heat conduction in a thin rectangular plate (v) Laplace equation in spherical coordinate system – electric potential around a spherical surface.

Reference Books

1. Mathematical methods for Physicists by George Arfken, Academic Press.
2. Applied Maths for engineers and Physicists by Pipes and Harvell (Mc Graw Hill).
3. Mathematical methods by Potter and Goldberg (Prentice Hall, India).
4. Special Relativity by A.P. French (English Language Book Society).
5. Theory of Relativity by Synge.



B.Sc.Part-II Semester IV

PAPER CODE 22-4012

PHYSICS-III

Electronics – II (MM34)

Note: 34 marks assigned to theory papers are distributed in following manner

Continuous evaluation	**10 marks**
Term End Main Exam	**24 marks**

Duration : 3 hour

Note:- In all five questions are to be set. Four questions will be out of the four units taking one question from every unit with 100% internal choice. Fifth question will be of short answer type covering entire course with no choice. The candidates will be required to attempt all the five questions.

UNIT – I

Amplifier with Feed Back: Concept of feed back, Positive and negative feedback. Voltage and current feedback circuits. Advantage of negative feedback, Stabilization of gain, effect of negative feedback on output and input resistances, reduction of nonlinear distortion, effect of 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 Hartley oscillators, R-C Oscillators, Crystal oscillators and its advantages.

UNIT – III

Field Effect Transistor: Junction field effect transistors (JFET), Metal oxide semiconductor field effect transistors (MOSFET), Circuit symbols, biasing, volt-ampere characteristics, Source follower operation of JFET, FET as variable voltage resistor.

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.

Reference Books

9. John D. Ryder, Electronics Fundamentals and Aplications, Prentice Hall of India Pvt. Ltd., New Delhi.
10. John D. Ryder, Engineering Electronics, McGraw Hill Book Company, New Delhi.
11. Jacob Millman and Christoc Halkias, Integrated Electronics, Analog and Digital Circuits and Systems, McGraw Hill Ltd.
12. Albert Paul Malvino, Digital Computer Electronics, Tata McGraw Hill Pub. Co, Ltd., New Delhi.
13. Kumar and Gupta, Handbook of Electronics.
14. G. K. Mithal, Handbook of Electronics.
15. G. K. Mithal, Electronic Devices and Applications.
16. R.P. Jain, Digital Electronics.

PAPER CODE P-22-4010

B. Sc Part II

PHYSICS PRACTICALS SYLLABUS

Note:- Total number of experiments to be performed by the students during the session should be 16 selecting and 8 from each section.

Section - A

1. Study of dependence of velocity of wave propagation on line parameter using torsional wave apparatus.
2. Study of variation of reflection coefficient with nature of termination using torsional wave apparatus.
3. Using Platinum resistance thermometer find the melting point of a given substance.
4. Using Newton's rings method find out the wave length of a monochromatic source and find the refractive index of liquid.
5. Using Michelson's interferometer find out the wavelength of given monochromatic source (Sodium light).
6. To determine dispersive power of prism.
7. To determine wave length by grating.
8. To determine wave length by Biprism.
9. Determine the thermodynamic constant γ using Clements & Desorme's method.
10. To determine thermal conductivity of a bad conductor by Lee's method.
11. Determination of ballistic constant of a ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature.

Section - B

1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath)
2. Study of power supply using two diodes / bridge rectifier with various filter circuits.
3. Study of half wave rectifier using single diode and application of L and π section filters.
4. To study characteristics of a given transistor PNP / NPN (Common emitter, Common base and common collector configurations)
5. Determination of band gap using a junction diode.
6. Determination of power factor ($\cos\theta$) of a given coil using CRO.
7. Study of single stage transistor audio amplifier (Variation of gain with frequency).
8. To determine e/m by Thomson's method.
9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.
10. Measurement of inductance of a coil by Anderson's bridge.
11. Measurement of capacitance and dielectric constant of a liquid and gang condenser by de-sauty bridge.