RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Physics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Solid State Physics **Paper Code : PHY-301**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.

UNIT –II

X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

UNIT -III

Hall Effect. Magnetism-Dia, Para, Ferro-magnetic properties of materials. Electron spin and magnetic moment. Magnetic susceptibility.

UNIT –IV

Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London equation. Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC).

Reference Book:

1. C. Kittel, Introduction to Solid State Physics, 7th Ed (1996) John Wiley & Sons, New Delhi.
2. H. Ibach and H. Lüth, Solid State Physics, An Introduction to Theory and Experiment, Springer-Verlag, Berlin, 1991
3. Pillai O S, Solid State Physics, New Age International Publishers (2007) New Delhi

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SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Physics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Advance Electronics **Paper Code : PHY-303**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Field Effect Transistors (FET),JFET structure, JFET operation, static, drain and transfer characteristics, pinch off Common source FET amplifier, small signal low frequency equivalent circuit- voltage gain. MOSFET-enhancement and depletion type,principle of operation, drain and transfer characteristics, idea of CMOS

UNIT –II

Operational Amplifiers: Ideal OP-AMP characteristics, concept of virtual ground, Definition of important terms in connection with OP-AMP: Offset voltage, CMRR, slew rate. Application of OP-AMP: Design of Inverting and non-inverting amplifier, Differential amplifier, Schmitt trigger, Integrator and Differentiator,

UNIT –III

Communication Principles: Modulation - elementary theory of Amplitude Modulation (AM) and Frequency Modulation (FM) modulation index. Detection of AM and FM waves.

UNIT –IV

AND, OR, NOT gates – truth tables, circuits of AND and OR gates using diodes and transistors; circuit of NOT gate using transistor; NAND and NOR as universal gate. Combination of gates for obtaining different Boolean function. de Morgan's theorem Half adder, full adder, digital comparator, decoder, encoder (ROM), multiplexer. Digital to analog and Analog to digital conversions.

Books Recommended:

1. Integrated Electronics – J. Millman and C. C. Halkias (Mc Graw Hill).
2. Electronic Fundamentals and Applications – D. Chattopadhyay and P. C. Rakshit.
3. Digital Logic and Computer Design – M. Moris Mano, (PHI (Pvt.) Ltd.).
4. Microprocessor Architecture, Programming and Application – R. A. Gaonkar (Willey EasternLtd.).

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SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)

B.Sc. (PCM) III Year (V Semester)

Schedule per week Practical : 4 Hrs

Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**

Subject : Physics Lab-V **Paper Code : PHY-307**

Note: Students are required to perform minimum five experiments from given list.

1. Surface tension by Jeager's Method.
2. Young's Modulus of steel bar using tensile
3. Modulus of rigidity by torsion method
4. Elastic constant by Scarle's method.
5. Viscosity of water by its flow through a uniform capillary tube.
6. To verify the Bernoulies theorem.
7. To determine viscosity of a given fluid.
8. To calibrate the orificemeter.

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SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-301**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Metal-ligand bonding in Transition Metal Complexes: Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field split ting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

UNIT-II

Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt (II).

UNIT-III

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of s and eff-values, orbital contribution to magnetic moments, application of magnetic moment data for 3dmetal complexes.

UNIT-IV

Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complexion.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Organic Chemistry **Paper Code : CH-303**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

NMR Spectroscopy-I: Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift, shielding and de-shielding of protons, proton counting, splitting of signals and coupling constants, magnetic equivalence of protons.

UNIT-II

NMR Spectroscopy-II: Discuss ion of PMR spectra of the molecules: ethyl bromide, n-propyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone. Simple problems on PMR spectroscopy for structure determination of organic compounds.

UNIT-III

Carbohydrates-I: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inter-conversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose in to mannose. Formation of glycos ides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D (+)-glucose & D (-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.

UNIT-IV

Carbohydrates-II: An introduc tion to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Organometallic Compounds:

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions

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B.Sc. (PCM) III Year (V Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Physical Chemistry **Paper Code : CH-305**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Quantum Mechanic s-I: Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonial operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance ,

UNIT-II

Physical Properties and Molecular Structure: Optical activity, polarization-(clausius-Mossotti equation). Orientation of dipoles in an electric field, dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

UNIT-III

Spectroscopy-I: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Bornoppenheimer approximation, Degrees of freedom.

Rotational Spectrum: Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT–IV

Spectroscopy-II, Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and**v**qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selectin rules, Quantum theory of Raman spectra

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Green Chemistry (Elective) **Paper Code : CH-305**

UNIT-I

Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

Principles of Green Chemistry and Designing a Chemical synthesis

Twelve principles of Green Chemistry with their explanations and special emphasis on the following with examples:

1. Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions.
2. Prevention/ minimization of hazardous/ toxic products reducing toxicity risk = (function) hazard x exposure ; waste or pollution prevention hierarchy
3. Green solvents– super critical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents

UNIT-II

4. Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy
5. Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups;
6. use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, bio catalysis, asymmetric catalysis and photo catalysis.
7. Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD —What you don't have cannot harm you , greener alternative to Bhopal Gas Tragedy (safer route to carbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.
8. Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT-III

Examples of Green Synthesis/ Reactions and some real world cases

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)

2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction

3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)
4. Surfactants for Carbon Dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.
5. Designing of Environmentally safe marine antifoulant.
6. Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments.
7. An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.
8. Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils
9. Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting

UNIT-IV

Future Trends in Green Chemistry

Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solvent less reactions; co crystal controlled solid state synthesis (C^2 S^3); Green chemistry in sustainable development.

Reference Books:

1. Ahluwalia, V.K. and Kidwai, M.R. New Trends in Green Chemistry, Anamalaya Publishers, 2005
2. Anastas, P.T. and Warner, J.K. Oxford Green Chemistry -Theory and Practical, University Press, 1998
3. Matlack, A.S. Introduction to Green Chemistry, Marcel Dekker, 2001
4. Cann, M.C. and Connely, M.E. Real-World Cases in Green Chemistry, American Chemical Society, Washington, 2000
5. Ryan, M.A. and Tinnesand, M., Introduction to Green Chemistry, American Chemical Society Washington, 2002
6. Lancaster, Mike, Green Chemistry an Introductory Text 2• nd Ed., RSC Publishing,. ISBN: 978- 1-84755-873-2

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Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**
Subject : Chemistry Lab-V **Paper Code : CH-307**

UNIT-I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insolubles):
Pb^{2+}, Hg^{2+} , Hg_2^{2+}, Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+} , Sb^{3+}, Sn^{2+}, Fe^{3+} ,Cr^{3+}, Al^{3+} , Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+}, Mg^{2+},

UNIT-II (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically

UNIT-III (Organic)

Chromatography Method

Determination of Rf values and identification o f organic compounds
(a) Separation of green leaf pigments (spinach leaves may be used) by paper chromatographic method
(b) Separation of a mixture of colored organic compounds using common organic solvents by TLC.

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCE
Department of Mathematics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Real Analysis **Paper Code : MA-301**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental Theorem of integral calculus. Mean value theorems of integral calculus.

UNIT-II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, μ - test , Integral as a function of a parameter. Continuity Differentiability and integrability of an integral of a function of a parameter.

UNIT-III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and Closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle.

UNIT-IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness, components, continuity in relation with connectedness.

Book s Recommended:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
2. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
4. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
6. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
7. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.
8. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Real Analysis, Krishna Prakashan Media

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Department of Mathematics
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B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Modern algebra **Paper Code : MA-303**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Definition of a group with examples and simple properties, permutation groups, subgroup, centre and normalizer, Cyclic groups, Left and right cosets, Coset decomposition, Lagrange's theorem and its consequences.

UNIT-II

Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group, Fundamental theorem of homomorphism, conjugancy relation, class equation.

UNIT-III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homo morphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

UNIT-IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is R[X1 , X2……Xn].

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.
5. J.B. Gallian: Abstract Algebra, Narosa Publishing House.
6. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Modern Algebra, Krishna Prakashan Media

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B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-305(A)**

Dynamics

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

UNIT-II

Motion of resisting medium, Constrained Motion (Circular and Cycloid only).

UNIT-III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

UNIT-IV

General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions.

Books Recommended:

1. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
2. F. Chorlton : Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.
4. M. Ray and G.C Sharma Dynamics S. Chand Publisher & Distributors

OR

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B.Sc. (PCM) III Year (V Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-305(B)**
Discrete Mathematics

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Propositional Logic- Propositional logic, Basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

UNIT-II

Relation- Definition, types of relation, composition of relations, domain and range of relation, pictorial representation of relation, properties of relation, partial ordering relation.Introduction of posets, Hasse, Diagram and Lattices, ordered set, Hasse diagram of partially ordered set.

UNIT-III

Graphs – Simple graph, multi graph, graph terminology, representation of graphs, Bipartite, regular, planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph colouring, chromatic number, isomorphism and homomorphism of graphs.

UNIT –IV

Tree- Definition of tree, Rooted tree, properties of trees, binary search tree, tree traversal.

Boolean Algebra- Basic definition, sum of products and products of sums, Logic gates and Karnaugh maps.

Books Recommended:

M.K.Gupta Discrete Mathematics publisher Krishna Pvt. Ltd.

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Department of Physics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (VI Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Atomic & Molecular Physics **Paper Code : PHY-302**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Brief review of early models of atomic structure. Hydrogen atom spectrum and the Bohr model. Franck-Hertz experiment. The reduced mass and the discovery of the hydrogen isotopes. Correspondence principle, spectra of hydrogen-like atoms, magnetic moment due to orbital motion, normal Zeeman effect and limits of Bohr Sommerfield theory.

UNIT –II

Quantum mechanics applied to the hydrogen atom problem:Stern-Gerlach experiment and electron spin, spin orbit coupling, Fine structure of the hydrogen atom spectrum.

UNIT –III

Many-electron atoms: Hund's rule and the periodic table, spectral terms, doublet structure of alkali spectra. The effective quantum number and quantum defect, penetrating and non-penetrating orbits. Anomalous Zeeman effect, Paschen- Bach effect, Stark effect in hydrogen.

UNIT –IV

Rotational and Vibrational Spectroscopy: diatomic molecule as a rigid rotator, effect of isotopic substitution, non-rigid rotator. Vibrational energy of a molecule, diatomic molecule as a simple harmonic oscillator. The anharmonic rotator, Rotational- Vibrational Spectra, population of energy levels. Electronic spectra of molecules, dissociation, Frank-Condon principle. Raman effect.

Books Recommended:

1. Atomic physics by J.B.Rajam & foreword by Louis De Broglie.(S.Chand & Co., 2007).
2. Atomic Physics by J.H.Fewkes & John Yarwood. Vol. II (Oxford Univ. Press, 1991).
3. Physics of Atoms and Molecules, Bransden and Joachein.
4. Molecular Spectroscopy, Banwell.

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B.Sc. (PCM) III Year (VI Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Nuclear Physics **Paper Code : PHY-304**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Introduction to the nucleus, Fermi gas model, Binding energy, Bethe-Weizsaecker mass formula and its application to explain most stable isobars and nuclear fission, Inferences of nuclear size from elastic electron-nucleus experiments (no derivation).

UNIT –II

Nucleon emission, separation energy, Alpha decay and its energy spectrum, Q-value, Gamow's theory of alpha decay (no derivation), Beta decay and its energy spectrum , Need for neutrinos, Q-value for beta decay, Gamma decay, Selection rules for gamma transitions (no derivation).

UNIT -III

Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction. Compound Nucleus. Scattering Problem in One Dimension : Reflection and Transmission by a Finite Potential Step. Stationary Solutions, Attractive and Repulsive Potential Barriers.

UNIT –IV

Law of Radioactive Decay. Half-life, Theory of Successive Radioactive Transformations. Radioactive Series, Binding Energy, Mass Formula. Liquid Drop Model. Mass formula. Shell Model. Meson Theory of Nuclear Forces and Discovery of Pion.

Reference Book:

1. Introductory Nuclear Physics: S. S. M. Wong.
2. Nuclear Physics: V. Devanathan.
3. Concepts of Nuclear Physics: B. L. Cohen.
4. Fundamentals of Nuclear Physics: B. B. Srivastava.
5. Introduction to Nuclear Physics: H. A. Enge.

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B.Sc. (PCM) III Year (VI Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Elective paper **Paper Code : PHY-306(A)**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

Particle Physics

UNIT-I

Interaction of Energetic particles with matter. Ionization chamber. GM Counter. Cloud Chambers. Wilson Cloud Chamber. Bubble Chamber. Scintillatipn Detectors. Semiconductor Detectors (Qualitative Discussion Only). An Idea about Detectors used in Large Hadron Collider..

UNIT –II

Elementary Particles (Qualitative Discussion Only) :- Fundamental Interactions. Classification of Elementary Particles. Particles and Antiparticles. Baryons, Hyperons, Leptons, and Mesons. Elementary Particle Quantum Numbers : Baryon Number, Lepton Number, Strangeness, Electric Charge, Hypercharge and Isospin.

UNIT -III

Supermultiplets of Mesons and Baryons. Conservation Laws and Symmetry. Different Types of Quarks and Quark Contents of Spin . Baryons. Photons, Gravitons, Gluons, Charms and Intermediate Vector Bosons. Idea of Standard Model. Higg's Boson.

UNIT –IV

Accelerators :- Van de Graaff Generator, Linear Accelerator, Cyclotron, Betatron, and Light and Heavy Ion Synchro-Cyclotron. Idea of Large Hadron Collider.

Books Recommended:

1. Introduction to Particle Physics ; M.P. khanna PHI publications
2. Nuclear and Particle Physics ; S.L. Kakani & Shubhra Kakani

OR

Paper Code : PHY-306(B)

Electromagnetic Theory

UNIT-I

Generalization of Ampere's Law, Displacement Current, Maxwell's Field Equations, Wave equation for electromagnetic (EM) field and its solution – plane wave and spherical wave solutions, transverse nature of field, relation between E and B; energy density of field, Poynting vector and Poynting's theorem, boundary conditions.

UNIT –II

Waves in an isotropic dielectric; wave equation, reflection and refraction at plane boundary, reflection and transmission coefficients, Fresnel's formula, change of phase on reflection, polarization on reflection and Brewster's law, total internal reflection.

UNIT –III

EM waves in conducting medium; wave equation in conducting medium, reflection and transmission at metallic surface – skin effect and skin depth, propagation of E-M waves between parallel and conducting plates – wave guides (rectangular only).

UNIT –IV

Dispersion : Equation of motion of an electron in a radiation field : Lorentz theory of dispersion – normal and anomalous. Scattering of radiation by a bound charge, Rayleigh's scattering (qualitative ideas), blue of the sky, absorption.

Books Recommended:

1. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill, 2006).
2. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
3. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
4. David J. Griffiths, Introduction to Electrodynamics, 3rd edition, (Benjamin Cummings 1998).

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Department of Physics
(Syllabus and Scheme of Studies w. e. f. 2016-19 onwards)
B.Sc. (PCM) III Year (VI Semester)

Schedule Per Week Practical : 4 Hrs
Examination Time : 4Hrs **Maximum Marks: 50 (20+30)**
Subject : Physics Lab-VI (Seminar& project) **Paper Code : PHY-308**

Students need to perform minimum two experiments from each section and in total eight experiments.

Activities:

1. Demonstrations

(Any four demonstrations equivalent to two experiments)

(i) Electromagnetic induction by using two coils
(ii) Magnet –magnet interaction
(iii) Study of Collision by using balls
(iv) Study of Signal generator using CRO (Sine, square wave signal, measurement of AC voltage, frequency)
(v) Demonstration of action potential
(vi) Moment of inertia effect on rotation

2. Computer aided demonstrations (Using computer simulations or animations)

(Any two demonstrations equivalent to two experiments)
(i) Coulomb's law
(ii) Vectors: visualization of vectors
(iii) Bohr's model
(iv) Carnot engine, diesel engine
(v) Graphs and their slopes, and Kinematics graphs (using computer simulations)
(vi) Model of SC, BCC, FCC, and HCP crystals.

3. **Mini projects/Hand on activities**
(Any one equivalent to two experiments)

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Department of Chemistry
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B.Sc. (PCM) III Year (VI Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-302**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT–I

Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls.

UNIT-II

Acids and Bases, HSAB Concept: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness

UNIT-III

Bioinorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Nitrogen fixation.

UNIT-IV

Silicones and Phosphazenes: Silicones and phosphazenes, their preparation, properties, structure and uses

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Industrial Chemicals and Environment **paper Code : CH-302**

(Elective)

UNIT-I

Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT-II

Industrial Metallurgy: Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

Environment and its segments : Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur. Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution. Pollution by SO2, CO2, CO, NOx, H2S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

UNIT-III

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

UNIT-IV

Energy & Environment Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

Biocatalysis Introduction to biocatalysis:

Importance in —Green Chemistry and Chemical Industry.

Reference Books:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.

2. R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley• Publishers, New Delhi.
3. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand• & Company Ltd. New Delhi.
5. K. De, Environmental Chemistry: New Age International Pvt., Ltd, New Delhi.
6. S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.
7. S.E. Manahan, Environmental Chemistry, CRC Press (2005).
8. G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).
9. A. Mishra, Environmental Studies. Selective and Scientific Books, New Delhi (2005).

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B.Sc. (PCM) III Year (VI Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Organic Chemistry **Paper Code : CH-304**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6marks each.*

UNIT-I

Heterocyclic Compounds-I: Introduction: Molecular orbital p icture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

UNIT-II

Heterocyclic Compounds-II: Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline

Organosulphur Compounds: Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates.

UNIT-III

Organic Synthesis *via* Enolates: Acidity of hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy re sins and polyurethanes. Natural and synthetic rubbers.

UNIT-IV

Amino Acids, Peptides& Proteins: Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of α-amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.

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B.Sc. (PCM) III Year (VI Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Physical Chemistry **Paper Code : CH-306**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types questions covering the entire syllabus and will be of 1 marks. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Spectroscopy-III: - Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle.

Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respective transitions.

UNIT-II

Photochemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

UNIT-III

Solutions: - Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raolut'slaw, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass,degree of dissociation and association of solutes.

UNIT-IV

Phase Equillibrium: Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component System, water and Sulpher systems. Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic, Pb-Ag system, desilverisation of lead

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B.Sc. (PCM) III Year (VI Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (30+20)**
Subject : Chemistry Lab-VI **Paper Code : CH-308**

UNIT-I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insoluble's):
NH^{4+}, CO_3^{2-}, S^{2-}, SO_3^{2-}, $S_2O_3^{2-}$, NO_2^-, CH_3COO^-, Cl^-, Br^-, I^-,NO_3^-, SO_4^{2-},$C_2O_4^{2-}$, PO_4^{3-}, BO_3^{3-}

UNIT-II (Physical)

1. To determine the strength of given acid solution (mono and dibasic acid)/$KMnO_4$ – Mohr salt potentiometrically.
2. To determine the molecular weight of a non-volatile solute by Rast method.
3. To standardize the given acid solution (mono and dibasic acid) pH metrically.

UNIT-III (Organic)

Synthesis of the following organic compounds:
(a) To prepare o-chlorobenzoic acid from anthranilic acid.
(b) To prepare p-bromoaniline from p-bromoacetanilide.
(c) To prepare m-nitroaniline from m-dinitrobenzene.
(d) To prepare S-Benzyl-iso-thiouronium chloride from thiourea

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

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SCHOOL OF BASIC AND APPLIED SCIENCE
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B.Sc. (PCM) III Year (VI Semester)

Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+50)**	
Paper Title	**: Complex Analysis**	**Paper Code**	**: MA-302**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Function of a complex variable, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions, Orthogonal system.

UNIT-II

Mappings by elementary functions: Translation, rotation, Conformal Mappings, Mobius transformations, Fixed pints, Cross ratio, Inverse Points and critical mappings, Conformal transforms.

UNIT-III

Complex integration, Line integral, Cauchy's fundamental theorem, Cauchy's integral formula, Morera's theorem, Liouville theorem, Maximum Modulus Theorem, Taylor and Laurent series.

UNIT-IV

Singularities and zeros of an analytic function, Rouche's theorem, Fundamental theorem of algebra, Analytic continuation.

1. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Complex Analysis Krishna Prakashan Media
2. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
3. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
4. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

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B.Sc. (PCM) III Year (VI Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Linear Algebra **Paper Code : MA-304**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

UNIT-II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

UNIT-III

Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

UNIT-IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram -Schmidt, Orthogonalization process.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
5. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Linear Algebra, Krishna Prakashan Media

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B.Sc. (PCM) III Year (VI Semester)

Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-306(A)**

Numerical Analysis

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

UNIT-II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

UNIT-III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one- third and three-eighth rule, Weddle's rule, Chebychev formula, Gauss Quadrature formula.

UNIT-IV

Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. Gupta and Malik, Numerical Analysis Krishna Prakashan Media.

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Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Elective paper **Paper Code : MA-306(B)**

Mathematical Statistics

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Probability Theory Three definition of probability (Mathematical, Empirical and axiomatic). Dependent, independent and compound events. Addition and multiplication theorems of probability, conditional probability. Bionomial and multinomial theorems of probability, Baye's theorem, Mathematical expectation and its properties, Moment generating function (m.g.f) and cumulants.

UNIT-II

DistributionDiscrete distributions- Binomial and Poisson distribution and their properties. Continuous distributions- Distribution function, Probability density function (pdf), Cauchy's distribution, rectangular distribution, exponential distribution, Beta, Gamma Normal distributions and their properties.

UNIT-III

Correlation and Regression Bivariate population, Meaning of correlation and regression. Coefficient of Correlation, rank Correlation, lines of regression. Properties of regression coefficients, Partial and multiple correlation and their simple properties.

UNIT –IV

Sampling Theory Simple and random sampling. Test of significance for large samples. Sampling distribution of Mean. Standard error. Test of significance based on χ^2. Test of significance based on t, F and Z distribution, ANOVA.

Books Recommended:

1. Sharma and Goel Mathematical Statistics publisher Krishna Pvt. Ltd.
2. S.D Sharma Mathematical Statistics