बी.ए./बी.एससी./बी.कॉम./बी.एच.एससी भाग–तीन,
आधार पाठ्यक्रम
प्रश्न पत्र–प्रथम
हिन्दी भाषा

पूर्णांक– 75

इकाई–एक (क) भारत माता : सुमित्रानंदन पंत

(ख) कथन की शैलियाँ

1. विवरणात्मक शैली 2. मूल्यांकन शैली

3. व्याख्यात्मक शैली 4. विचारात्मक शैली

इकाई–दो (क) सूखी डाली : उपेन्द्रनाथ अश्क

(ख) विभिन्न संरचनाएँ

1. विनम्रता सूचक संरचना 2. विधि सूचक संरचना

3. निषेध परक संरचना 4. काल–बोधक संरचना

5. स्थान–बोधक संरचना 6. दिशा बोधक संरचना

7. कार्य–कारण सम्बन्ध संरचना 8. अनुक्रम संरचना

इकाई–तीन (क) वसीयत : मालती जोशी

(ख) कार्यालयीन पत्र और आलेख

1. परिपत्र 2. आदेश

3. अधिसूचना 4. ज्ञापन

5. अनुस्मारक 6. पृष्ठांकन

इकाई–चार (क) योग की भक्ति : हरिवंश राय बच्चन

(ख) अनुवाद : स्वरूप एवं परिभाषा, उद्देश्य स्त्रोत भाषा और लक्ष्य भाषा, अच्छे अनुवाद की विशेषताएँ, अनुवाद प्रक्रिया, अनुवादक

इकाई–पांच (क) संस्कृति और राष्ट्रीय एकीकरण : योगेश अटल

(ख) घटनाओं, समारोहों आदि का प्रतिवेदन, विभिन्न प्रकार के निमंत्रण पत्र।

मूल्यांकन योजना : प्रत्येक इकाई से एक–एक प्रश्न पूछा जाएगा। प्रत्येक प्रश्न में आंतरित विकल्प होगा। प्रत्येक प्रश्न के 15 अंक होंगे। इसलिए प्रत्येक प्रश्न के दो भाग 'क' और 'ख' होंगे एवं अंक क्रमशः 8 एवं 7 अंक होंगे। प्रश्नपत्र का **पूर्णांक 75** निर्धारित है।

B.A./B.Sc./B.Com./B.H.Sc. Part III
Foundation Course
English Language

M.M. 75

The question paper for B.A./B.Sc./B.Com./B.H.Sc. III Foundation course, English Language and General Answers shall comprise the following items : Five question to be attempted, each carrying 3 marks.

UNIT-I   Essay type answer in about 200 words. 5 essay type question to be asked three to be attempted.   15

UNIT-II   Essay writing   10

UNIT-III Precise writing   10

UNIT-IV   (a)   Reading comprehension of an unseen passage   05

          b)   Vocabulary based on text   10

UNIT-V   Grammar Advanced Exercises   25

Note: Question on unit I and IV (b) shall be asked from the prescribed text. Which will comprise of popular create writing and the following items. Minimum needs housing and transport Geoeconomic profile of M.P. communication Educate and culture. Women and Worm in Empowerment Development. management of change, physical quality of life. War and human survival, the question of human social value survival, the question of human social value, new Economic Philosophy Recent Diberaliation Method) Demoration decentralization (with reference to 73, 74 constitutional Amendment.

Books Prescribed:

Aspects of English Language and Development-Published by M.P. Hindi Granth Academy, Bhopal.

UNIT-1   THE MULTI DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and

Importance Natural Resources:

Renewable and Nonrenewable Resources

(a)   Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining. dams and their effects on forests and tribal people and relevant forest Act.

(b)   Water resources: Use and over-utilization of surface and ground water, floods drought, conflicts over water, dam's benefits and problems and relevant Act.

(c)   Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

(d)   Food resources: World food problems, changes caused by agriculture and overgrazing. effects of modern agriculture, fertilizer-pesticide problems, water logging,salinity.

(e)   Energy resources: Growing energy needs, renewable and non-renewable energy sources. use of alternate energy sources.

(f)   Land resources: Land as a resource, land degradation, man induced landslides soil erosion and desertification.

<div align="right">(12 Lecture)</div>

UNIT-II   ECOSYSTEM

(a)   Concept, Structure and Function of and ecosystem
  - Producers, consumers and decomposers.
  - Energy flow in the ecosystem
  - Ecological succession
  - Food chains, food webs and ecological pyramids.
  - Introduction, Types, Characteristics Features, Structure and Function of Forest, Grass, Desert and Aquatic Ecosystem.

(b)   Biodiversity and its Conservation
  - Introduction - Definition: genetic. species and ecosystem diversity
  - Bio-geographical classification of India.
  - Value of biodiversity: Consumptive use. Productive use, social ethics, aesthetic and option values.
  - Biodiversity at global, National and local levels.
  - India as mega-diversity nation.

- Hot spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wild life conflict.
- Endangered and endemic species of India.
- Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.

(12 Lecture)

UNIT- III

(a) **Causes, effect and control measures of**

- Air water, soil, marine, noise, nuclear pollution and Human population.
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Disaster Management: floods, earthquake, cyclone and landslides.

(12 Lecture)

(b) **Environmental Management**

- From Unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people, its problems and concerns.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Wasteland reclamation
- Environment protection Act: Issues involved in enforcement of environmental legislation.
- Role of Information Technology in Environment and Human Health.

UNIT- IV

General background and historical perspective- Historical development and concept of Human Rights, Meaning and definition of Human Rights, Kind and Classification of Human Rights. Protection of Human Rights under the UNO Charter, protection of Human Rights under the Universal Declaration of Human Rights, 1948. Convention on the Elimination of all forms of Discrimination against women. Convention on the Rights of the Child, 1989.

UNIT- V

Impact of Human Rights norms in India, Human Rights under the Constitution of India, Fundamental Rights under the Constitution of India, Directive Principles of State policy under the Constitution of India, Enforcement of Human Rights in India. Protection of Human Rights under the Human Rights Act, 1993- National Human Rights Commission, State Human Rights Commission and Human Rights court in India. Fundamental Duties under the Constitution of India.

Reference/ Books Recommended

1. SK Kapoor- Human rights under International Law and Indian Law.
2. HO Agrawal- Internation Law and Human Rights
3. एस.के. कपूर – मानव अधिकार
4. जे.एन. पान्डेय – भारत का संविधान
5. एम.डी. चतुर्वेदी –भारत का संविधान
6. J.N.Pandey - Constitutional Law of India
7. Agarwal K.C. 2001 Environmental Biology, Nidi pub. Ltd. Bikaner
8. Bharucha Erach, the Biodiversity of India, Mapin pub. Ltd. Ahmedabad 380013, India, Email: mapin@icenet.net(R)
9. Bruinner R.C. 1989, Hazardous Waste Incineration. McGraw Hill Inc.480p
10. Clark R.S. Marine pollution, Clanderson press Oxford (TB)
11. Cuningham, W.P.Cooper. T.H.Gorhani, E & Hepworth. M.T,200
12. Dr. A.K.- Environmental Chemistry. Wiley Eastern Ltd.
13. Down to Earth, Center for Science and Environment (R)
14. Gloick, H.P. 1993 Water in crisis. pacific institute for studies in Deve. Environment & Security. Stockholm Eng. Institute. Oxford University, Press. m 473p.
15. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Mumbai (R)

NEW CURRICULUM OF B.Sc. Part-III

CHEMISTRY

The new curriculum will comprise of three papers of 33, 33 and 34 marks each and practical work of 50 marks. The Curriculum is to be completed in 180 working days as per UGC norms and conforming to the directives of Govt. of Chhattisgarh. The theory papers are of 60 hrs. each duration and practical work of 180 hrs duration.

PAPER–I
INORGANIC CHEMISTRY

60 Hrs., Max Marks 33

UNIT-I **METAL-LIGAND BONDING IN TRANSITION METAL COMPLEXES**

(A) Limitations of valence bond theory, Limitation of Crystal Field Theory, Application of CFSE, tetragonal distortions from octahedral geometry, Jahn–Teller distortion, square planar geometry. Qualitative aspect of Legend field and MO Theory.

(B) 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, Trans- effect, theories of trans effect. Mechanism of substitution reactions of square planar complexes

UNIT-II **MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES**

Types of magnetic behavior, methods of determining magnetic susceptibility, spin only formula, L-S coupling, correlation of $\mu_{so(spin\ only)}$ and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Electronic spectra of Transition Metal Complexes.

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

UNIT-III **ORGANOMETALLIC CHEMISTRY**

Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands. Metal carbonyls: 18-electron rule, electron count of mononuclear,

polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series.

Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT.

π- acceptor behavior of CO (MO diagram of CO to be discussed), Zeist's salt: Preparation and structure.

Catalysis by Organometallic Compounds –

Study of the following industrial processes and their mechanism :

1. Alkene hydrogenation (Wilkinsons Catalyst)
2. Polymeration of ethane using Ziegler – Natta Catalyst

UNIT-IV   **BIOINORGANIC CHEMISTRY**

Essential and trace elements in biological processes, Excess and deficiency of some trace metals, Toxicity of some metal ions (Hg, Pb, Cd and As), metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to Ca^{2+} and Mg^{2+}, nitrogen fixation.

UNIT-V   **HARD AND SOFT ACIDS AND BASES (HSAB)**

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, Applications of HSAB principle.

INORGANIC POLYMERS

Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones. Silicates, phosphazenes and polyphosphate.

REFERENCE BOOKS

1.   Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson and P. L. Gaus, Wiley.
2.   Concise Inorganic Chemistry, J. D. Lee, ELBS.
3.   Concepts of Models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley.
4.   Inorganic Chemistry, D. E. Shriver, P. W. Atkins and C. H. Langford, Oxford.
5.   Inorganic Chemistry, W. W. Porterfield, Addison – Wiley.
6.   Inorganic Chemistry, A. G. Sharp, ELBS.
7.   Inorganic Chemistry, G. L. Miessler and D. A. Tarr, Prentice Hall.
8.   Advanced Inorganic Chemistry, Satya Prakash.
9.   Advanced Inorganic Chemistry, Agarwal and Agarwal.
10. Advanced Inorganic Chemistry, Puri, Sharma, S. Naginchand.
11. Inorganic Chemistry, Madan, S. Chand.
12. Aadhunik Akarbanic Rasayan, A. K. Shrivastav & P. C. Jain, Goel Pub.
13. Uchchattar Akarbanic Rasayan, satya Prakash & G. D. Tuli, Shyamal Prakashan.
14. Uchchattar Akarbanic Rasayan, Puri & Sharma.
15. Selected topic in Inorganic Chemistry by Madan Malik & Tuli, S. Chand.

Paper – II
ORGANIC CHEMISTRY

60 Hrs. Max Marks 33

UNIT-I

HETEROCYCLIC COMPOUNDS

Classification and nomenclature, Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Indole (Fischer indole synthesis and Madelung synthesis), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet- Spengler reaction, Pomeranz-Fritsch reaction).

UNIT II

A. ORGANOMETALLIC REAGENT

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

B. ORGANIC SYNTHESIS VIA ENOLATES

Active methylene group, alkylation of diethylmalonate and ethyl acetoacetate, Synthesis of ethyl acetoacetate: The Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Robbinson annulations reaction.

UNIT-III

BIOMOLECULES

A. CARBOHYDRATES Occurrence, classification and their biological importance. Monosaccharides: relative and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani Fischer synthesis and Ruff degradation; Disaccharides – Structural comparison of maltose, lactose and sucrose. Polysaccharides – Elementary treatment of starch and cellulose.

B. AMINO ACIDS, PROTEINS AND NUCLEIC ACIDS Classification and Nomenclature of amino acids, Configuration and acid base properties of amino acids, Isoelectric Point, Peptide bonds, Protein structure, denaturation/ renaturation, Constituents of nucleic acid, DNA, RNA nucleoside, nucleotides, double helical structure of DNA.

UNIT-IV

SYNTHETIC POLYMERS

A. Addition or chain growth polymerization, Free radical vinyl polymerization, Ziegler-Natta polymerization, Condensation or Step growth polymerization, polyesters, polyamides, phenols- formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes, natural and synthetic rubbers.

B. SYNTHETIC DYES Colour and constitution (Electronic Concept). Classification of Dyes. Chemistry of dyes. Chemistry and synthesis of Methyl Orange, Congo Red, Malachite Green, Crystal Violet, phenolphthalein, fluorescein, Alizarine and Indigo.

UNIT-V

A. INFRA-RED SPECTROSCOPY

Basic principle, IR absorption Band their position and intensity, IR spectra of organic compounds.

B. UV-VISIBLE SPECTROSCOPY

Beer Lambert's law, effect of Conjugation, Types of electronic transitions λ_{max}, Chromophores and Auxochromes, Bath chromic and Hypsochromic shifts, Intensity of absorption Visible spectrum and colour.

C. NMR SPECTROSCOPY

Basic principles of Proton Magnetic Resonance, Tetramethyl silane (TMS) as internal standard, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant (J); Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple organic compounds. ^{13}CMR spectroscopy: Principle and applications.

REFERENCE BOOKS

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.
2. Organic Chemistry, L. G. Wade Jr. Prentice Hall.
3. Fundamentals of Organic Chemistry, Solomon's, John Wiley.
4. Organic Chemistry, Vol I, II, III S. M. Mukherjee, S. P. Singh and R. P. Kapoor, Wiley Easters (New Age).
5. Organic Chemistry, F. A. Carey, McGraw Hill.
6. Introduction to Organic Chemistry, Struiweisser, Heathcock and Kosover, Macmillan.
7. Acheson. R.M. Introduction to the Chemistry of Heterocyclic compounds, John Wiley & Sons (1976).
8. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.
9. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning IndiaEdition, 2013.
10. Kalsi. P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.
11. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.

Paper – III
PHYSICAL CHEMISTRY

60 Hrs. Max Marks 34

UNIT-I **QUANTUM MECHANICS–I**
Black-body radiation, Planck's radiation law, photoelectric effect, Compton effect. Operator: Hamiltonian operator. angular momentum operator, Palladian operator. postulate of quantum mechanics. eigen values, eigen function, Schrodinger time independent wave equation, physical significance of ψ & ψ^2, application of Schrodinger wave equation to particle in a one dimensional box, hydrogen atom (separation into three equations) radial and angular wave functions.

UNIT-II **A.** **QUANTUM MECHANICS–II**
Quantum Mechanical approach of Molecular orbital theory, basic ideas-criteria for forming M.O. and A.O., LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions, bonding and ant bonding wave functions, Concept of σ, σ^*, π, π^* orbital's and their characteristics, Hybrid orbitals-sp,sp^2,sp^3 Calculation of coefficients of A.O.'s used in these hybrid orbital's.
Introduction to valence bond model of H_2, comparison of M.O. and V.B. models. Huckel theory, application of Huckel theory to ethene, propene, etc.

UNIT-III **SPECTROSCOPY**
Introduction: Characterization of Electromagnetic radiation, regions of the spectrum, representation of spectra, width and intensity of spectral transition, Rotational Spectrum of Diatomic molecules. Energy levels of a rigid rotor, selection rules, determination of bond length, qualitative description of non-rigid rotator, isotopic effect.
Vibration Spectroscopy: Fundamental vibration and their symmetry vibrating diatomic molecules, Energy levels of simple harmonic oscillator, selection rules, pure vibration spectrum, determination of force constant, enharmonic oscillator
Raman spectrum: Concept of polarizability, quantum theory of Raman spectra, stokes and antismoke lines, pure rotational and pure vibration Raman spectra. Applications of Raman Spectra.
Electronic Spectroscopy: Basic principles, Electronic Spectra of diatomic molecule, Franck-Condon principle, types of electronic transition, application of electronic spectra.

UNIT-IV **ELECTROCHEMISTRY-I**
A. Electrolytic conductance: Specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch law, application of Kohlrausch law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titrations.
B. Theories of strong electrolyte: limitations of Ostwald's dilution law, weak and strong electrolytes, Elementary ideas of Debye-Huckel-Onsager's equation for strong electrolytes , relaxation and electrophoretic effects.
C. Migration of ions: Transport number, Determination by Hittorf method and moving boundary method, ionic strength.

UNIT-V   **ELECTROCHEMISTRY-II**

A. Electrochemical cell and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells, EMF of the cell and effect of temperature on EMF of the cell, Nernst equation Calculation of ΔG, ΔH and ΔS for cell reactions.

B. Single electrode potential: standard hydrogen electrode, calomel electrode, quinhydrone electrode, redox electrodes, electrochemical series

C. Concentration cell with and without transport, liquid - junction potential, application of concentration cells in determining of valiancy of ions , solubility product and activity coefficient

D. Corrosion-types, theories and prevention

REFERENCE BOOKS

1. Physical chemistry, G.M. Barrow. International Student Edition McGraw Hill.
2. University General Chemistry, CNR Rao, Macmillan.
3. Physical Chemistry R.A. Albert, Wiley Eastern.
4. The elements of Physical Chemistry P.W. Alkin, Oxford.
5. Physical Chemistry through problems, S.K. Dogra, Wiley Eastern.
6. Physical Chemistry B.D. Khosla.
7. Physical Chemistry, Puri & Sharma.
8. Bhoutic Rasayan, Puri & Sharma.
9. Bhoutic Rasayan, P.L. Soni.
10. Bhoutic Rasayan, Bahl & Tuli.
11. Physical Chemistry, R.L. Kapoor, Vol- I-IV.
12. Introduction to quantum chemistry, A.K. Chandra, Tata McGraw Hill.
13. Quantum Chemistry, Ira N. Levine, Prentice Hall.

Max. Marks-50

INORGANIC CHEMISTRY

Gravimetric analysis:

- Estimation of nickel (II) using Dimethylglyoxime (DMG).
- Estimation of copper as CuSCN
- Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.
- Estimation of Al (III) by precipitating with oxen and weighing as Al (oxen)₃ (aluminum oxinate).
- Estimation of Barium as $BaSO_4$

Inorganic Preparations:

- Tetraanminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$
- Cis and trans K $[Cr(C_2O_4)_2. (H_2O)_2]$ Potassium dioxalatodiaquachromate(III)
- Tetraamminecarbonatocobalt (III) ion
- Potassium tris(oxalate)ferrate(III)/ Sodium tris(oxalate)ferrate(III)
- Cu(I) thiourea complex, Bis (2,4-pentanedionate) zinc hydrate; Double salts (Chrome alum/ Mohr's salt)

ORGANIC CHEMISTRY

1. Preparation of organic Compounds
   - Acetylating of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-,m-, p-anisidine) and phenols (β-naphthol, vanillin, salicylic acid)
   - Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, panisidine) and one of the following phenols (β-naphthol, resorcinol, p cresol) by Shorten-Baumann reaction.
   - Bromination of any one of the following: a. Acetanilide by conventional methods b.Acetanilide using green approach (Bromated-bromide method)
   - Nitration of any one of the following: a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate).
   - Reduction of p-nitrobenzaldehyde by sodium borohydride.
   - Hydrolysis of amides and esters.
   - Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.
   - Benzylisothiouronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).
   - Aldol condensation using either conventional or green method.
   - Benzil-Benzilic acid rearrangement.
   - Preparation of sodium polyacrylate.
   - Preparation of urea formaldehyde.
   - Preparation of methyl orange.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization, melting point and TLC.

2. Qualitative Analysis Analysis of an organic mixture containing two solid components Using water, NaHCO₃, NaOH for separation and preparation of suitable derivatives.
3. Extraction of caffeine from tea leaves.
4. Analysis of Carbohydrate: aldoses and ketoses, reducing and non-reducing sugars.

5. Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy. (Spectra to be provided).
6. Estimation of glycogen by Sorenson's formalin method.
7. Study of the titration curve of glycogen.
8. Estimation of proteins by Lowry's method.
9. Study of the action of salivary amylase on starch at optimum conditions.
10. Effect of temperature on the action of salivary amylase.

PHYSICAL CHEMISTRY

Conductometry
- Determination of cell constant
- Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
- Perform the following conduct metric titrations:
  i. Strong acid vs. strong base
  ii. Weak acid vs. strong base
  iii. Mixture of strong acid and weak acid vs. strong base
  iv. Strong acid vs. weak base
- To determine the strength of the given acid conduct metrically using standard alkali solution.
- To determine the solubility and solubility product of a sparingly soluble electrolyte conduct metrically
- To study the saponification of ethyl acetate conduct metrically Potentiometer/pH metry Perform the following potent/pH metric titrations:
  i. Strong acid vs. strong base
  ii. Weak acid vs. strong base
  iii. Dibasic acid vs. strong base
  iv. Potassium dichromate vs. Mohr's salt
  v. Determination of pka of monobasic acid

UV/ Visible spectroscopy
- Verify Lambert-Beer's law and determine the concentration of $CuSO_4/KMnO_4/K_2Cr_2O_7$ in a solution of unknown concentration
- Determine the concentrations of $KMnO_4$ and $K_2Cr_2O_7$ in a mixture.
- Study the kinetics of iodination of prop none in acidic medium.
- Determine the amount of iron present in a sample using 1,10-phenathroline.
- Determine the dissociation constant of an indicator (phenolphthalein).
- Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide.
- Study of pH-dependence of the UV-Vis spectrum (200-500 nm) of potassium dichromate.
- Spectral characteristics study (UV) of given compounds (acetone, acetaldehyde, acetic acid, etc.) in water.
- Absorption spectra of $KMnO_4$ and $K_2Cr_2O_7$ (in 0.1 M H_2SO_4) and determine λ_{max} values.

Note: Experiments may be added/deleted subject to availability of time and facilities
REFERENCE BOOKS:
1. Vogel, A.I. Quantitative Organic Analysis, Part 3, Pearson (2012).31
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)

3. Furness. B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
4. Ahluwalia, V.K. & Agarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
5. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000)
6. Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi.

8 Hrs.   **PRACTICAL EXAMINATION**   **M.M.50**

Five experiments are to be performed.

1. **Inorganic** - Two experiments to be performed. Gravimetric estimation compulsory

    08 marks. (Manipulation 3 marks)

    Anyone experiment from synthesis and analysis   **04 marks.**

2. **Organic** - Two experiments to be performed. Qualitative analysis of organic mixture containing two solid components. compulsory carrying **08 marks** (03 marks for each compound and two marks for separation).

    One experiment from synthesis of organic compound (Single step)   **04 marks.**

3. Physical-One physical experiment   **12 marks.**
4. Sessional   **04 marks.**
5. Viva Voce   **10 marks.**

In case of Ex-Students, one mark each will be added to Gravimetric analysis and Qualitative analysis of organic mixture and two marks in Physical experiment.

B.Sc. Part-III
PHYSICS
PAPER-I
RELATIVITY, QUANTUM MECHANICS,
ATOMIC MOLECULAR AND NUCLEAR PHYSICS

UNIT-I   Reference systems, inertial frames, Galilean invariance propagation of light, Michelson-Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass.

UNIT-II   Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect, Compton effect, Wave-particle duality, uncertainty principle, de Broglie's hypothesis for matter waves, the concept of Phase and group velocities, experimental demonstration of mater waves. Davisson and Garner's experiment. Consequence of de Broglie's concepts, Bohr's complementary Principle, Bohr's correspondence principle, Bohr's atomic model, energies of a particle in a box, wave packets. Consequence of the uncertainty relation, gamma ray microscope, diffraction at a slit.

UNIT-III   Quantum Mechanics: Schrodinger's equation, Statistical interpretation of wave function, Orthogonality and normalization of wave function, Probability current density, Postulator basis of quantum mechanics, operators, expectation values, Ehrenfest's theorem, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.

UNIT-IV   Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules. Discrete set of electronic energies of molecular, quantization of vibration and rotational energies, determination of inter-nuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.

UNIT-5   Structure of nuclei:- Basic Properties of Nuclei: (1) Mass, (2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (5) Magnetic Moment (μ), (6) Stability and (7) Binding Energy, Nuclear Models:- Liquid Drop Model, Mass formula, Shell Model, Types of Nuclear reactions, laws of conservation, Q-value of reactions, Interaction of Energetic particles with matter, Ionization chamber, GM Counter, Cloud Chambers, 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 Is spin, introductory idea of discovery of High's Boson.

TEXT AND REFERENCE BOOKS:
1. H.S. Mani and G.K. Mehta: "Introduction to Modern Physics"" (Affiliated East-West Press, 1989).

B.Sc. Part-III
PHYSICS
PAPER-II
SOLID STATE PHYSICS, SOLID STATE
DEVICES AND ELECTRONICS

UNIT-I Amorphous and crystalline solids. Elements of symmetry, seven crystal system. C lattices, Crystal planes, Miller indices, Law's equation for X-ray diffraction. Bragg's L Bonding in solids, classification. Cohesive energy of solid, Made lung constant, evalua of Parameters. Specific heat of solids, classical theory (Dulong-Petit's law), Einstein a Debye theories, Vibration modes of one dimensional monatomic lattice. Dispersi relation, Brillion Zone.

UNIT-II Free electron model of a metal, Solution of one dimensional Schrödinger equation in constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kroni Penny model without mathematical details), Difference between Metals, Insulator a Semiconductors, Hall effect, Die, Para and Ferromagnetism, Langevin's theory of die a para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.

UNIT-III Intrinsic and extrinsic semi conductors, Concept of Fermi level, Generation an recombination of electron hole pairs in semiconductors, Mobility of electrons and hole drift and diffusion currents, p-n junction diode, depletion width and potential barrie junction capacitance, I-V characteristics, Tunnel diode, Zinger diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics.

UNIT-IV Half and full wave rectifier, rectifier efficiency ripple factor, Bridge rectifier, Filters, Inductor filter, L and π section filters, Zinger diode, regulated power supply using zinger diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, h-parameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Bark House's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator.

UNIT-V Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter.

TEXT AND REFERENCE BOOKS:
1. Introduction to solid state physics: C. Kittle.
2. Solid State Physics: A.J. Dekkar.
3. Electronic Circuits: Mottershead.
4. Electronic Circuits: Millman and Halkias.
5. Semiconductor Devices: S.M. Size.
6. Electronic devices: T.L. Floyd.
7. Device and Circuits: J. Millman and C. Halkias.
8. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit.
9. Electricity and Magnetism: K.K. Tiwari.

B.Sc. Part-III
PHYSICS
PRACTICALS
Minimum 16 (Eight from each group)
Experiments out of the following or
Similar experiments of equal standard

1. Determination of Planck is constant.
2. Determination of e/m by using Thomson tube.
3. Determination of e by Millikan's methods.
4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron proton).
5. Absorption spectrum of iodine vapor.
6. Study of alkali or alkaline earth spectra using a concave grating.
7. Study of Zeeman effect for determination of a Lande g-factor.
8. Analysis of a given band spectrum.
9. Study of Raman spectrum using laser as an excitation source.
10. Study of absorption of alpha and beta rays.
11. Study of statistics in radioactive measurement.
12. Goniometric study of crystal faces.
13. Determination of dielectric constant.
14. Hysteresis curve of transformer core.
15. Hall-probe method for measurement of magnetic field.
16. Specific resistance and energy gap of semiconductor.
17. Characteristics of transistor.
18. Characteristics of tunnel diode.
19. Study of voltage regulation system.
20. Study of regulated power supply.
21. Study of lissajous figures using CRO.
22. Study of VTVM.
23. Study of RC and TC coupled amplifiers.
24. Study of AF and RF oscillators.
25. Find roots of $f(x) = 0$ by using Newton-Rap son Method.
26. Find root of $f(x) = 0$ by using secant method.
27. Integration by Simpson rule.
28. To find the value of V at
29. String manipulations.
30. Towers of Hanoi (Non-recursive).
31. Finding first four perfect numbers.
32. Quadratic interpolation using Newton's forward-difference formula of degree two.

TEXT AND REFERENCE BOOKS:
1. B.G. Strachan, Solid state electronics devices II edition (Prentice-Hall of India New Delhi 1986)
2. W.D. Stanley, Electronics devices, circuits and applications (Prentice-Hall new jersey, USA 1988).
3. S. Lipschutz and A Poe; Schaum's outline of theory and problems of programming with Fortran (Mc Graw-Hill Book Co. Singapore, 1986).
4. C Dixon, Numerical Analysis.

2. A Beiger, "Prospective of Modern Physics".
3. H.E. White, Introduction to Atomic Physic".
4. Barrow, "Introduction to Molecular Physics".
5. R.P. Feynman, R.B. Leighton and M Sands, "The Feynman Lectures on Physics", Vol.III (B.I. Publications, Bombay, Delhi, Calcutta, Madras).
6. T.A. Littlefield and N Thorley, "Atomic and Nuclear Physics" (Engineering Language Book Society)
7. H.A. Engel, "Introduction to Nuclear Physics", (Addision-Wesly)
8. Eisenberg and Renwick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley)
9. D.P. Khandelwal, "Optics and Atomic Physics", (Himalaya Publishing House, Bombay, 1988).
10. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi, 1984.
11. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
12. Theoretical Nuclear Physics, J.M. Blatt & V.F.Weisskopf (Dover Pub. Inc., 1991).

Session- 2023-24.

B.A./B.Sc. Part-III
MATHEMATICS
There shall be three theory papers. Two compulsory and one optional. Each paper carrying 50 mark divided into five units and each unit carry equal marks.

B.A./B.Sc. Part-III
PAPER - I
ANALYSIS

REAL ANALYSIS

UNIT-I Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Diriclet test. Multiplication of series. Double series. Partial derivation and differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions.

UNIT-II Riemann integral. Inerrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests. Abel's and Dirichlet' tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.

COMPLEX ANALYSIS

UNIT-III Complex numbers as ordered pairs. Geometrical representation of complex numbers. Stereographic projection. Continuity and differentiability of complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed points, Cross ratio Inverse points and critical mappings. Conformal mappings.

METRIC SPACES

UNIT-IV Definition and examples of metric spaces. Neighborhoods, Limit points, Interior points, Open and Closed sets, Closure and interior. Boundary points, Sub-space of a metric space. Cauchy sequences, Completeness, Cantor's intersection theorem. Contraction principle, construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.

UNIT-V Dense subsets. Baire Category theorem. Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity, isometry and homeomorphism. Equivalent metrics. Compactness, sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and Compact sets, Connectedness, Components, Continuous functions and Connected sets.

REFERENCES:
1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Real Analysis, Oxford & IBH publishing Co., New Delhi, 1970.
3. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
4. D. Somasundaram and B. Chaudhary, A First Coarse in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co. New Delhi.
6. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
7. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw- Hill, NewYork, 1990.
8. Mark J. Ablowitz and A.S. Fokas, Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
9. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.
10. E.T. Cop son, Metric Spaces, Cambridge University Press, 1968.
11. P.K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House, New Delhi, 1996.
12. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 1963.

B.A./B.Sc. Part-III
MATHEMATICS
PART - II
ABSTRACT ALGEBRA

UNIT-I Group-Auto orphisms, inner auto orphism. Auto orphism of groups and the computations, Contumacy relation, Normalize, Counting principle and the class equation of a finite group. Center for Group of prime-order. Abelianizing of a group and universal property. Sylow's theorems, Sylow subgroup, Structure theorem for finite Abelian groups.

UNIT-II Ring theory-Ring homomorphism. Ideals and quotient rings. Field of quotients of an integral domain, Euclidean rings, polynomial rings. Polynomials over the rational field. The Eisenstein criterion, polynomial rings over commutative rings, Unique factorization domain. R unique factorization domain implies so is $R[x_1, x_2 ..... x_n]$. Modules. Sub modules, Quotient modules, Homomorphism and Isomorphism theorems.

UNIT-III Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.

UNIT-IV Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Ad joint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms.

UNIT-V Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

REFERENCES:
1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. N. Jacobson, Basic Algebra, Vols. I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Shanti Narayan, A Text Book of Modern Abstract Algebra, S.Chand & Co. New Delhi.
4. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2"" Edition) Cambridge University Press, Indian Edition, 1997.
6. K. Hoffman and R. Kunze, Linear Algebra, (2nd Edition), Prentice Hall. Englewood Cliffs, New Jersey, 1971.
7. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic Linear Algebra with MATLAB. Key College Publishing (Springer-Verlag) 2001.
8. S. Kumaresan, Linear Algebra, A Geometric Approach, Prentice-Hall of India, 2000.
9. Vivek Sahai and Vikas Bist, Algebra, Norosa Publishing House, 1997.
10. I.S. Luther and I.B.S.Passi, Algebra, Vol. I-Groups, Vol. II-Rings. Narosa Publishing House (Vol. I-1996, Vol. II-1999)
11. D.S. Malik, J.N. Mordeson, and M.K. Sen, Fundamentals of Abstract Algebra, McGraw- Hill International Edition, 1997.

B.A./B.Sc. Part-III
MATHEMATICS
PAPER - III (OPTIONAL)
(I) PRINCIPLES OF COMPUTER SCIENCE

UNIT-I   Data Storage - Storage of bits. Main Memory. Mass Storage. Coding Informatic Storage. The Binary System. Storing integers, storing fractions. communication error: Data Manipulation - The Central Processing Unit. The Stored-Program Cor Programme Execution. Other Architectures. Arithmetic/Logic Instructions. Comp Peripheral Communication.

UNIT-II   **Operating System and Networks** - The Evolution of Operating System. Oper System Architecture. Coordinating the Machine's Activities. Handling Compe Among Process. Networks. Networks Protocol.
Software Engineering - The Software Engineering Discipline. The Software Life C Modularity. Development Tools and Techniques. Documentation. Software Owne and Liability.

UNIT-III   **Algorithms** - The Concept of an Algorithm, Algorithm Representation. Algo thm Discovery. Iterative Structures. Recursive Structures. Efficiency and Correctness. (Algorithms to be implemented in C++). **Programming Languages** - Hist ical Perspective. Traditional Programming Concepts, Program Units. Lang age Implementation. Parallel Computing. Declarative Computing.

UNIT-IV   **Data Structures** - Arrays. Lists. Stacks. Queues. Trees. Customised Data Types. Object Oriented Programming.
File Structure - Sequential Files. Text Files. Indexed Files. Hashed Files. The Role of the Operating System.
Database Structure - General Issues. The Layered Approach to Database Implementation. The Relational Model. Object-Oriented Database. Maintaining Database Integrity. E-R models

UNIT-V   **Artificial Intelligence** - Some Philosophical Issues. Image Analysis. Reasoning, Control System Activities. Using Heuristics. Artificial Neural Networks. Application of Artificial Intelligence.
Theory of Computation - Turning Machines. Computable functions. A Non computable Function. Complexity and its Measures. Problem Classification.

REFERENCES:
1. J. Glen Brook hear, Computer Science: An Overview, Addition -Wesley.
2. Stanley B. Lippmann, Josee Lojoie, C++ Primer (third Edition), Addison-Wesley.

UNIT-I Sets and Propositions - Cardinality. Mathematical Induction. Principle of inclusion and exclusion. Computability and Formal Languages - Ordered Sets. Languages. Phrase Structure Grammars. Types of Grammars and Languages. Permutations. Combinations and Discrete Probability.

UNIT-II Relations and Functions - Binary Relations. Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle.
Graphs and Planar Graphs - Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Planner Graphs. Trees.

UNIT-III Finite State Machines - Equivalent Machines. Finite State Machines as Language Recognizers. **Analysis of Algorithms** - Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions.

UNIT-IV Recurrence Relations and Recursive Algorithms - Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Particular Solution. Total Solution. Solution by the Method of Generating Functions. Brief review of Groups and Rings.

UNIT-V Boolean Algebras - Lattices and Algebraic Structures. Duality, Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Prepositional Calculus. Design and Implementation of Digital Networks. Switching Circuits.

REFERENCES:

1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science Series, 1986

B.A./B.Sc. Part-III
MATHEMATICS
PAPER - III (OPTIONAL)
(III) PROGRAMMING IN C AND NUMERICAL ANALYSIS
(Theory & Practical)
Theory component will have maximum marks 30.
Practical component will have maximum marks 20.

UNIT-I   Programmer's model of a computer. Algorithms. Flow Charts. Data Types. Arithmetic and input/output instructions. Decisions control structures. Decision statements. Logical and Conditional operators. Loop. Case control structures. Functions. Recursions. Preprocessors. Arrays. Puppetting of strings. Structures. Pointers. File formatting.

Numerical Analysis

UNIT-II   **Solution of Equations:** Bisection, Secant, Regula Falsi, Newton's Method, Roots of Polynomials. **Interpolation:** Lagrange and Hermite Interpolation, Divided Differences, Difference Schemes, Interpolation Formulas using Differences. Numerical Differentiation. Numerical Quadrature: Newton-Cote's Formulas. Gauss Quadrature Formulas. Chebychev's Formulas.

UNIT-III   **Linear Equations:** Direct Methods for Solving Systems of Linear Equations (Guass Elimination, LU Decomposition, Cholesky Decomposition), Iterative Methods (Jacobi, GaussSeidel, Relaxation Methods).
The Algebraic Eigen value problem: Jacobi's Method, Givens' Method, Householder's Method, Power Method, QR Method, Lanczos' Method.

UNIT-IV   **Ordinary Differential Equations:** Euler Method, Single-step Methods, Runge-Kutta's Method, Multi-step Methods, Milne-Simpson Method, Methods Based on Numerical Integration, Methods Based on Numerical Differentiation, Boundary Value Problems, Eigenvalue Problems.
Approximation: Different Types of Approximation, Least Square Polynomial Approximation, Polynomial Approximation using Orthogonal Polynomials, Approximation with Trigonometric Functions, Exponential Functions, Chebychev Polynomials, Rational Functions.

Monte Carlo Methods
UNIT-V   Random number generation, congruential generators, statistical tests of pseudo-random numbers. Random variate generation, inverse transform method, composition method, acceptance rejection method, generation of exponential, normal variates, binomial and Poisson variates.
Monte Carlo integration, hit or miss Monte Carlo integration, Monte Carlo integration for improper integrals, error analysis for Monte Carlo integration.

REFERENCES:

1.   Henry Mulish and Herbert L. Cooper, Spirit of C: An Introduction to Modern Programming, Jaico Publishers, Bombay.
2.   B.W. Kernighan and D.M. Ritchie. The C Programming Language 2nd Edition, (ANSI features) Prentice Hall, 1989.
3.   Peter A Darnel and Philip E. Margolis, C: A Software Engineering Approach, Narosa Publishing House, 1993.
4.   Robert C. Hutehisonand Steven B. Just, Programming using C Language, McGraw Hill, 1988.
5.   Les Hancock and Morris Krieger, The C Primer, McGraw Hill, 1988.

B.A./B.Sc. Part-III
MATHEMATICS
PAPER - III (OPTIONAL)
(IV) PRACTICAL
PROGRAMMING IN C AND NUMERICAL ANALYSIS

LIST OF PRACTICAL TO BE CONDUCTED...

1. Write a program in C to find out the largest number of three integer numbers.
2. Write a program in C to accept monthly salary from the user, find and display income tax with the help of following rules :

   Monthly Salary Income Tax

   9000 or more   40% of monthly salary

   7500 or more   50% of monthly salary

   7499 or less   20% of monthly salary

3. Write a program in C that reads a year and determine whether it is a leap year or not.
4. Write a program in C to calculate and print the first n terms of Fibonacci series using looping statement.
5. Write a program in C that reads in a number and single digit. It determines whether the first number contains the digit or not.
6. Write a program in C to computes the roots of a quadratic equation using case statement.
7. Write a program in C to find out the largest number of four numbers using function.
8. Write a program in C to find the sum of all the digits of a given number using recursion.
9. Write a program in C to calculate the factorial of a given number using recursion.
10. Write a program in C to calculate and print the multiplication of given 2D matrices.
11. Write a program in C to check that whether given string palindrome or not.
12. Write a Program in C to calculate the sum of series:

$$1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \ldots\ldots + \frac{1}{n!}x^n$$

13. Write a program in C to determine the grade of all students in the class using Structure. Where structure having following members - name, age, roll, sub1, sub2, sub3, sub4 and total.
14. Write a program in C to copy one string to another using pointer. (Without using standard library functions).
15. Write a program in C to store the data of five students permanently in a data file using file handling.

B.Sc.Part-III
BOTANY
PAPER –I
(ANALYTICAL TECHNOLOGY PLANT PATHOLOGY, EXPERIMENTAL EMBRYOLOGY, ELEMENTARY BIOSTATISTICS, ENVIRONMENTAL POLLUTION AND CONSERVATION)

UNIT-i   Structure, Principle and applications of analytical instrumentation.

Chromatography technique, Oven, Incubator, Autoclave, Centrifuge, Spectrophotometer

UNIT-II   Plant Tissue culture techniques, growth media, totipotency, protoplast culture, somatic hybrids and cybrids, micropropagation , somaclonal variations, haploid culture.

Analytical techniques: Microscopy-Light microscope, Electron microscope

UNIT-III   General principles of plant pathology, general symptoms of fungal, bacterial and viral diseases, mode of infection, diseases resistance and control measures, plant quarantine. A study of epidemiology and etiology of following plant diseases.

Rust diseases of wheat, Tikka diseases of groung nut, Red rot of sugar can, Bacterial blight of rice, Yellow vein mosaic of b hindi, Little leaf of brinjal.

UNIT-IV   Introduction to pollution, green house gases, Ozone depletion, Dissolve oxygen, B.O.D., C.O.D.

Bio magnification, Eutrophication, Acid precipitation, Phytoremediation, Plant indicators,. Biogeographical Zones of India, Concept of biodiversity, CBD, MAB, National parks and biodiversity Hot spots, Conservation strategies, Red Data Book, IUCN threat categories, invasive species, endemic species, concept of sustainable development.

UNIT-V   **ELEMENTARY BIOSTATISTICS:**
Introduction and application of Biostatics, measure of central tendency-Mean, Median, Mode. measures of dispersal-Standard deviation, standard error.

BOOKS RECOMMENDED:
- Singh. RS, Plant Diseases, Oxford & IBH, New Delhi.
- Pandey. BP, Plant Pathology, S.Chand Publishing, New Delhi
- Sharma, PD. Microbiology and Plant pathology, Rastogi Publications, Meerut
- Sharma PD, Mycology and Phytopathology, Rastogi Publications, Meerut
- Singh JS. Singh SP and Gupta, SR, Ecology Environmental Science and Conservation, S. Chand Publishing, New Delhi
- Sharma, PD. Ecology and Environment, Rastogi Publiications, Meerut
- Bhojwani, SS and Razdan, MK, Plant Tissue Culture:Theory and Practices, Elsevier
- Sharma AK, Text book of Biostatistics, Discovery Publishing House Pvt. Ltd.

UNIT-I   Cell and cell organelles, organization and morphology of chromosomes, giant chromosomes, cell division, Mendel's laws, gene interactions, linkage and crossing over, chromosomal aberration, polyploidy, sex linked inheritance, sex determination, cytoplasmic inheritance, gene concept: cistron, muton, recon.

UNIT-II   Nucleic acids, structure and forms of DNA and RNA, DNA/RNA as genetic material, replication of DNA, biochemical and molecular basis of mutation, genetic code and its properties, mechanism of transcription and translation in prokaryotes, regulation of gene expression, Operon model.

UNIT-III Recombinant DNA, Enzymes in recombinant DNA technology, cloning vectors (Plasmid, Bacteriophages, Cosmids, Phagemids), gene cloning, PCR, Application of Biotechnology; G.M.Plants, Monoclonal antibodies, DNA finger printing

UNIT-IV   Protein: Chemical composition, primary, secondary and tertiary structure of Proteins.

Carbohydrate: general account of monosaccharides, disaccharids and Polysaccharides

Fat: Structure and properties of fats and fatty acids, synthesis and breakdown.

UNIT-V   ENZYMES: Nomenclature and classifaction, components of enzyme, theories of enzyme action, enzyme kinetics (Michaelis-Menten constant), allosteric enzymes, isozymes, Abzymes. Ribozymes, factors affecting enzyme activity.

BOOKS RECOMMENDED:
- Nelson, DL, Cox, MM, Lehninger Principles of Biochemistry, W.H. freeman and Company, New York, USA.
- Cooper, GM, The Cell: A Molecular Approach, ASM Press & Sunderland, Washington, D.C. Sinauer Associates, MA.
- Singh BD, Fundamental of Genetics, Kalyani Publication
- Singh BD, Genetics, Kalyani Publication
- Gupta. PK, Cell and Molecular Biology, Rastogi Publications, Meerut
- Singh. BD, Biotechnology: Expanding Horizons, Kalyani publications
- Gupta. PK, Elements of Plant Biotechnology, Rastogi Publications, Meerut
- Gupta, SN, Concepts of Biochemistry, Rastogi Publications, Meeru
- Jain, JL., Jain S, Jain, N, Fundamentals of Biochemistry, S Chand Publishing, New Delhi

B.Sc.Part-III
BOTANY
PRACTICAL

1. Study of host parasite relationship of plant diseases listed above.
2. Demonstration of preparation of Czapek's Dox medium and Potato dextrose agar medium, sterilization of culture medium and pouring.
3. Inoculation in culture tubes and petriplates.
4. Gram Staining.
5. Microscopic examination of Curd.
6. Study of plant diseases as listed in the theory paper.
7. Biochemical test of carbohydrate and protein.
8. Instrumentation techniques

PRACTICAL SCHEME

TIME: 4 Hrs.   **M.M.: 50**

1. Plant Disease/Symptoms	10
2. Instrumentation techniques	05
3. Staining of Microbes	05
4. Tissue Culture techniques	05
5. Spotting	10
6. Project Work/ Field Study	05
7. Viva-Voce	05
8. Sessional	05

B.Sc. Part-III
ZOOLOGY
PAPER-I
ECOLOGY, ENVIRONMENTAL BIOLOGY:
TOXICOLOGY, MICROBIOLOGY AND MEDICAL ZOOLOGY

UNIT-I **(Ecology)**
- Aims and scopes of ecology
- Major ecosystems of the world-Brief introduction
- Population- Characteristics and regulation of densities
- Communities and ecosystem
- Bio-geo chemical cycles
- Air & water pollution
- Ecological succession

UNIT-II **(Environmental Biology)**
- Laws of limiting factor
- Food chain in fresh water ecosystem
- Energy flow in ecosystem- Trophic levels
- Conservation of natural resources
- Environmental impact assessment

UNIT-III **(Toxicology)**
- Definition and classification of Toxicants
- Basic Concept of toxicology
- Principal of systematic toxicology
- Heavy metal Toxicity (Arsenic, Mercury, Lead, Cadmium)
- Animal poisons- snake venom, scorpion & bee poisoning
- Food poisoning

UNIT-IV **(Microbiology)**
- General and applied microbiology
- Microbiology of domestic water and sewage
- Microbiology of milk & milk products
- Industrial microbiology: fermentation process, production of penicillin, alcoholic beverages', bioleaching.

UNIT-V **(Medical Zoology)**
- Brief introduction to pathogenic microorganisms, Ricketssia, Spirochetes, AIDS and Typhoid
- Brief account of life history & pathogen city of the following pathogens with reference to man: prophylaxis & treatment
- Pathogenic protozoan's- Endameba, Trypanosome & Plasmodium
- Pathogenic helminthes- Schist soma
- Nematode pathogenic parasites of man
- Vector insects

B.Sc. Part-III
ZOOLOGY
PAPER-II
GENETICS, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES

UNIT-I **(Genetics)**
- Linkage & linkage maps, Sex Determination and Sex Linkage
- Gene interaction- Incomplete dominance & Co dominance, Supplementary gene, Complementary gene. Epitasis Lethal gene, Pleiotropic gene and multiple alleles.
- Mutation: Gene and chromosomal mutation
- Human genetics: chromosomal alteration: Down, Edward, Patau, Turner and Klinefelter Syndrome Single gene disorders: Alkaptonuria, Phenylketonuria, Sickle cell anemia, albinism and color blindness

UNIT-II **(Cell Physiology)**
- General idea about pH & buffer
- Transport across membrane Diffusion and Osmosis
- Active transport in mitochondria & endoplasmic reticulum
- Enzymes-classification and Action

UNIT-III **(Biochemistry)**
- Amino acids & peptides- Basic structure & biological function
- Carbohydrates & its metabolism-Glycogenesis; Gluconeogenesis; Glycolysis; Glycogenolysis; Cosi-cycle
- Lipid metabolism- Oxidation of glycerol; Oxidation of fatty acids
- Protein Catabolism- Deamination, transamination, transmethylation

UNIT-IV **(Biotechnology)**
- Application of Biotechnology
- Recombinant DNA & Genecloning
- Cloned genes & other tools of biotechnology (Tissue culture, Hybridism, Transgenic Animals and Gene library)

UNIT-V **(Biotechniques)**
1. Principles & techniques about the following:
   i. pH meter
   ii. Colorimeter
   iii. Microscopy- Light microscopes: Compound, Phase contrast & Electron microscopes
   iv. Centrifuge
   v. Separation of bimolecular by chromatography & electrophoresis

Session - 2023-24

B.Sc. Part-III
ZOOLOGY
PRACTICAL

The practical work in general shall be based on syllabus prescribed in theory.
The candidates will be required to show knowledge of the following:
- Estimation of population density, percentage frequency, relative density.
- Study of producers and consumers in grassland.
- Detection of gram-negative and gram-positive bacteria.
- Blood group detection (A,B,AB,O)
- R. B. C. and W.B.C count
- Blood coagulation time
- Preparation of hematin crystals from blood of rat
- Observation of Drosophila, wild and mutant.
- Chromatography-Paper or gel.
- Colorimetric estimation of Protein.
- Mitosis in onion root tip.
- Biochemical detection of Carbohydrate, Protein and Lipid.
- Study of permanent slides of parasites, based on theory paper.
- Working principles of pH meter, colorimeter, centrifuge and microscope.

Scheme of marks distribution   Time: 3:30hrs

- Hematological Experiment   08
- Ecological Experiment: Grassland Ecosystem/   06
  Population Density/Frequency/relative density
- Bacterial staining   05
- Biochemical experiment   06
- Practical based on Instrumentation (Chromatography/
  pH meter/microscope/centrifuge.   05
- Spoting (5 spots)   10
- Viva   05
- Sessional   05