

JAI PRAKASH UNIVERSITY,
CHAPRA

SYLLABUS

for

Bachelor of Science and Commerce
(Honours and Subsidiary)

TDC - III

**JAI PRAKASH UNIVERSITY
CHAPRA**

COURSES OF STUDY

FOR

B.Sc. / B.Com.

(GENERAL AND HONOURS)

Part III EXAMINATIONS



JAI PRAKASH UNIVERSITY PUBLICATION

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JAI PRAKASH UNIVERSITY, CHAPRA

COURSES OF STUDY for

B.Sc./B.Com.(General/Honours) Part III Examination COMPULSORY SUBJECT GENERAL AND ENVIRONMENTAL STUDIES

Time - 3 hours

There will be one compulsory Theory paper of 100 marks, henceforth called 'GES' consisting of two groups. Candidates are requested to answer FIVE questions selecting atleast TWO questions from each group. The examination will be three hours duration.

Group A

50 Marks

GENERAL STUDIES

1. Social Reforms movement in the 19th and 20th Century.
2. National Freedom Struggle since 1857 A.D. and Attainment of Independence.
3. National Culture Heritage.
4. General Awareness about important provisions of Indian Constitution.
5. (i) Planning for Development in Post-Independent India
(ii) Agricultural and Industrial Development (iii) Problem of poverty and unemployment (iv) Priority of reconstruction of Bihar
(v) Role of Gram Panchayat in eradication of Poverty.
6. United Nations and its major agencies. (ii) Human rights
(iii) Value Education and (iv) Consumer awareness.
7. Fascinating World of Living beings.
8. Elementary knowledge of Physics.

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9. Chemistry in action.
10. Modern achievements in Science and Technology.

Group B

50 Marks

ENVIRONMENTAL STUDIES

1. National resources - Land, Water, Forest and Mineral resources.
2. Concept of an Ecosystem - An elementary idea of major ecosystems.
3. Biodiversity and its conservation - Hot spots and threats to biodiversity.
4. Pollution causes, effects and control measures.
5. Relevance of Sustainable development. Water Conservation and Waste Land Reclamation.
6. Public awareness about Environmental Issues. Pollution growth & its impact on Environment Women and Child Development - AIDS.

COURSES OF STUDY

for

B.Sc. (General) PART III Examination

(See page no. 1 for compulsory subjects)

Optional Subjects for B.Sc.(General) Part III Examination

PHYSICS (GENERAL)

Paper III

Time - 3 hours

Full Marks - 75

Twelve questions to be set. Six to be answered (at least Two from each group)

Group A

Quantum Mechanics (Six questions to be set)

Rise and fall of Planck-Bohr quantum Theory, Duality of radiation and matter, deBroglie's hypothesis, justification for the relation, $\lambda = h/p$, experimental confirmation.

Phase and group velocities of a wave, Formation of a wave packet illustrations, Uncertainty principle; relating to position and momentum, relating to energy and time; applications.

General equation of the wave propagation, propagation of matter waves, time dependent and time independent schrodinger equations, physical meaning of ψ .

Simple one - dimensional problems; particle in a box, concept of a potential - well, Linear Harmonic oscillator.

Group B

Solid State Physics (Six questions to be set)

Crystal geometry : Crystal lattices; Crystals planes and Miller indices, unit cells.

Crystallography : Diffraction of X-rays by a crystal Lattice, Laue's formulation of X-ray diffraction; reciprocal lattice, Brillouin zones, Laue spots.

Free electron theory of metals, Heat capacity of electron gas, electrical conductivity of metal, Band theory of solids, Bloch's theorem, Kronig-Penny model.

Semi-Conductor Diodes : p-n junction diode and its application in rectifiers, clippers and limiter, zener diode and its applications.

Field Effect Transistor : Classification of various types of FET, JFET and its drain characteristics, Idea of MOSFET.

Amplifier : R. C. Coupled amplifier (Two stage), Feedback amplifier.

Oscillators : Positive feedback, Barkhausen criterion, RC oscillator, Phase shift oscillator.

PHYSICS (GENERAL)

Practical

Time - 3 hours

Full Marks - 25

(One experiment to be performed in examination)

(Expt.- 15, viva-6, NB- 4)

The course shall include the following experiments :

1. Michelson's interferometer.
2. Studying the diffraction of light at a single aperture.
3. Fresnel diffraction at a straight edge and a slit.
4. Fraunhofer diffraction at a single slit.
5. Resolving limit of grating and prism.
6. Study of polarisation of light by simple reflection.
7. Study of optical rotation by solutions (using a vertical setup for easy change of length and a simple polaroid pair to avoid distraction).
8. Spectrum of atomic hydrogen and Rydberg constant.

CHEMISTRY (GENERAL)**Paper III**

Time - 3 hours

Full Marks - 75

Six questions to be answered in all, Four questions to be set from each group, out of which Two questions to be answered from each group.

Group A**Physical (25 Marks)**

1. **Liquid state** - Structure of the liquid state, Physical properties of liquids and their methods of determination, Vapour pressure, Surface tension, Parachor, Viscosity and refractive index, liquid crystals.
2. **Chemical Kinetics** - Rate laws, order & molecularity of chemical reactions, first order and second order derivation of rate constant, experimental methods for determination of order of reaction, temperature dependence of reaction rate, collision theory of reaction rate, activation energy concept.
3. **Colloidal Chemistry** - Classification, Preparation of colloidal solutions and their purifications, preparation and properties of colloidal sol., Origin of charge on colloidal particle, Hardy-Schulze law and gold number.
4. **Adsorption and Catalysis** - Types of adsorption, physical adsorption and chemisorption, adsorption isotherms, nature of adsorbed state.
5. **Electro Chemical Cell** - Electrolytic and Galvanic Cells, reversible electrode, EMF of a cell and its measurement, Nernst equation, standard electrode potential, types of electrodes, applications of EMF measurement for the determination of solubility product and ionic product of water, potentiometric titration.

Group B**Organic (25 Marks)**

1. **Stereo isomerism** - Different types of isomerism, Geomercial isomerism - maleic and fumeric acids, Z and E system of nomenclature, optical isomerism - optical activity, asymmetric Carbon atom, Chirality and chiral molecules, enantiomers, distereoisomers, D and L nomenclature, racemisation, resolution of racemic compounds, conformation of ethane.
2. **Amino Acids** - Introduction, general classification and synthesis of

α - amino acids, reaction with mineral acids, alkylhalide, Ac_2O , HNO_2 , HI and NH_3 and esterification, action of heat on α , β and γ amino acids, general idea about proteins.

3. **Urea** - Preparation, properties and estimation.

4. **Polynuclear Aromatic Hydrocarbons** - Preparation, properties and structure of naphthalene, anthracene and Phenanthrene, Synthesis of important compounds like naphthols, naphthylamines, naphthoic acids anthraquinone.

5. **Basic Principle of Reaction Mechanism** - Inductive effect, electromeric effect, vander Waal's forces and weak interaction, hyperconjugation, nucleophilic substitution, addition and elimination reactions (only elementary idea of their mechanisms).

6. **Dyes** - Triphenylmethane dyes, phthalein dyes, Colour and Constitution.

Group C

Inorganic (25 Marks)

Chemistry of Transition Metals-Position of d-block elements in the Periodic Table (i) Chemistry of Ti, Mn, Cr, Co and Ni with reference to

- i. Principle of separation of metals.
- ii. Comparison with higher Congeners.
- iii. Compounds in different Oxidation states.
- iv. Oxidising and reducing properties of compounds
- v. Shape and structure of important compounds
- vi. Analytical test of ions and radicals derived from them.

2. **Organic Reagents in Inorganic Analysis** - Properties of inner complexes, Specificity and selectivity of reagents, use of (i) EDTA (ii) α -nitroso, β - naphthol (iii) Cupferon (iv) Oxine (v) Dimethyl glyoxime (vi) nitron (vii) neoxime.

3. **Nuclear Chemistry and Isotope** - Mass defect, packing fraction n/p ratio and nuclear stability. Formation and identification of isotopes Positive rays analysis, Aston mass spectrograph, separation of isotopes, Heavy water-preparation, properties and Industrial applications.

4. **Nonaqueous solvents** - Classification, solvent criteria, water as a universal solvent, liquid ammonia and liquid sulphurdioxide, HSAB principle.

5. **Analytical Chemistry** - Principles involved in estimation by gravi-

metric and volumetric method of (i) Mg (ii) Ca (iii) Cu (iv) Fe (v) Ba (vi) Pb and (vii) Sn. Principles of qualitative analysis, analytical table, principles of separation of cations into groups, applications of solubility product, principle and common ion effect.

Books Recommended

1. Text Book of Physical Chemistry - Barrow
2. Advanced Physical Chemistry - Puri & Sharma
3. Text Book of Physical Chemistry - P. C. Rakshit
4. A Text Book of Organic Chemistry - Bahl & Bahl
5. Advanced Organic Chemistry - Jerry March
6. Organic Chemistry (vol. I & II) - I. L. Finar
7. A Text Book of Inorganic Chemistry - Puri & Sharma
8. Inorganic Chemistry - J. D. IEE
9. Modern Physico-Inorganic Chemistry - T. Sharma

CHEMISTRY (GENERAL)

Practical

Time - 3 hours

Full Marks - 25

1. Determination of weight by
 - i. Victor-Meyer Method.
 - ii. Surface tension of liquids by Stalagmometer
 - iii. Partition Coefficient of benzoic acid between benzene and water, I_2 between carbon tetrachloride and water 10 marks
2. Organic preparations or Detection
 - i. Detection of N, S and X in Organic Compounds
 - ii. Detection of functional groups in Organic Compounds
(a)-OH (Phenolic) (b) -CHO, (c) $>C=O$ (d)-COOH, (e) $-NH_2$ and (f) $-NO_2$
 - iii. Preparation of following Compounds :
 - (a) Acetylation of para-nitroaniline. (b) Nitration of nitrobenzene.
 - (c) Oxidation of benzaldehyde and (d) Hydrolysis of esters-ethyl benzoate and salicylate 10 marks
3. Record of Class work and Viva-voce 5 marks

Books Recommended

1. Text Book of Inorganic Quantitative Analysis by A. I. Vogel
2. Text Book of Inorganic Qualitative Analysis by A. I. Vogel
3. Qualitative Organic Analysis by Clarke
4. Practical Physical Chemistry by J. C. Ghosh

MATHEMATICS (GENERAL)**Paper III**

(Same for B.A. & B.Sc.)

Time - 3 hours

Full Marks - 100

Twelve questions to be set. Six to be answered selecting at least one from each group.

Group A**Vector Analysis (Two questions)**

Classification of vector, Triple products, Differentiation of vector functions, Differentiation of a product of two vectors, Gradient of scalar, Divergence and curl of a vector in cartesian co-ordinates.

Group B**Statics (Two questions)**

Reduction of general plane force system, Equation of the line of action of the resultant of coplaner forces, Necessary conditions for a system of coplaner forces to be in equilibrium, Principle of virtual work.

Group C**Dynamics (Two questions)**

Basic laws of Mechanics in absolute frame of reference, Simple harmonic motion, Elastic spring, Hooke's law, Motion in a plane, Components of velocity and acceleration : Cartesian, Radial and transverse, Tangential and normal.

Group D**Differential Equations (Four questions)**

Formation and solution of differential equations, Differential equations of first order, Separation of variables, Homogeneous form, Exact differential equations, Equations of the first order but not of first degree including Clairaut's forms, Linear differential equations of second order with constant coefficients, Complementary functions and particular integrals, Orthogonal trajectory.

Group E**Linear Programming (Two questions)**

Convex sets and their properties, Linear programming problem, Graphical solutions, Theory of simplex method and their simple applications.

Books Recommended

- | | | |
|-----------------------------|---|--------------------------|
| 1. Vector Analysis | - | R. N. Das & K. K. Jha |
| 2. Vector Analysis | - | Laljee Prasad |
| 3. Advanced Vector Analysis | - | C. E. WEATHERBURN |
| 4. Statics | - | Das Gupta & S. B. Prasad |
| 5. Dynamics | - | P. N. Chatterjee |
| 6. Differential Equations | - | Gupta & Prasad |
| 7. Linear Programming | - | Laljee Prasad |

BOTANY (GENERAL)**Paper III****Physiology, Environmental Biology and Economic Botany****Time - 3 hours****Full Marks - 75**

Ten questions to be set, **Four** from each Group A and Group B and **Two** from Group C. Candidates are required to answer any **Five** questions attempting at least **One** from each group.

Group A**Physiology**

- i. Water relation
- ii. Stomatal Regulation
- iii. Translocation of organic solutes
- iv. Photosynthesis - Electron transfer, Photophosphorylation, C_3 and C_4 Cycle.
- v. Respiration - Glycolysis, Krebs Cycle
- vi. Elementary idea of Phytohormones

Group B**Environmental Biology**

- i. Elementary idea of Ecosystem and its components

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- ii. Plant succession - Hydrosere and Xerosere
- iii. Water and Air pollution - causes and control
- iv. Ecological anatomy of Hydrophyte and Xerophyte

Group C

Economic Botany

- i. Systematic position, Morphological nature of parts and economic importance of the following :
Mango, Shisham, Wheat, Rice, Gram, Pea, Tea, Mustard, Carrot, Vashak.

BOTANY (GENERAL)

Practical

(Practical on course included in Paper III)

Time - 3 hours

Full Marks - 25

- 1. Temporary slide preparation of the given material and its ecological characteristics 7 marks
- 2. Comment upon Physiology experiment 5 marks
- 3. Systematic position and part of economic importance and its morphology (Only Two to be set) 4 marks
- 4. Practical Records 5 marks
- 5. Viva 4 marks

ZOOLOGY (GENERAL)**Paper III****Ecology, Palaeozoology and Zoogeography****Time - 3 hours****Full Marks - 75**

Five questions are to be set from each group. Students shall answer any five questions in all, attempting at least **two** questions from each group.

Group A**Ecology**

- i. Concept of Biosphere.
- ii. Definition, structure and functions of a typical ecosystem.
- iii. Major ecosystems of the world and their features.
- iv. Pond ecosystem and forest ecosystem.
- v. Physical and Biotic factors.
- vi. Biogeochemical cycles of Oxygen, Nitrogen and Carbon.
- vii. Energy flow in ecosystem.

Animal Behaviour

- i. Scope of Ethology.
- ii. Innate behaviour.
- iii. Learned behaviour.
- iv. Parental care in Fishes and Amphibians.
- v. Social behaviour in insects.
- vi. Migratory behaviour in Birds.

Group B**Palaeozoology and Zoogeography**

- i. Different geological eras of the world, their climatic conditions and fauna.
- ii. Zoogeographical realms of the world and their boundaries and vegetations.
- iii. Biogeographical distributions of animal in Oriental, Ethiopian and Australian regions.
- v. Fossils and their mode of formation.

Economic Zoology

- i. Sericulture, Lac-culture and Pisci-culture.
- ii. Preliminary idea of the common pests of paddy, wheat and sugar-cane and their control.
- iii. Vectors of Kala-azar, Malaria and Filariasis - their prevention and control.

ZOOLOGY (GENERAL)**Practical****Time - 3 hours****Full Marks - 25**

1. Quantitative estimation of dissolved oxygen in water with the help of Winkler's volumetric method. 6 marks
2. Determination of pH of different water samples 4 marks
3. Moisture content of soil/identification and comment on the zooplanktons present in pond water sample 5 marks
4. **Spotting** 2×2=6 marks
Identification and comment on the specimens
Palaeozoology - fossil (one)
Economic Zoology (any two)
Silkworm-larva, Silkworm Pupa, Adult silk worm, Lac insect, Fishing gears and Museum specimen showing parental care, Mouth parts of male and female *Culex* and *Anopheles*
5. **Practical Records** 4 marks

COURSES OF STUDY

for

B.Sc. (Honours) Part III Examination**PHYSICS (HONOURS)****Paper V****(Mathematical Physics, Classical Mechanics and
Quantum Mechanics)****Time - 3 hours****Full Marks - 100**

Twelve questions to be set. Six to be answered (taking atleast two from each group)

Group A**Mathematical Physics & Basics of Computer****(Four questions to be set)**

Curvilinear co-ordinates, Cartesian, Spherical polar and cylindrical co-ordinates, Orthogonal transformation of co-ordinates.

Partial differential equations and their solution by separation of variable, Laplace's equation and its solution, Wave equation and its solution, Poisson's equation.

Functions of complex variables, Cauchy - Reimann equations, Complex potentials and conformal transformation, Cauchv's integral, Residue Theorem, Integration of complex functions.

Types of computers and their basic components, Input-ouput devices, concept of hardware and siftware, BITS and BYTES, Computer programming of some simple mathematical problems in BASIC and FORTRAN Languages.

Group B**Classica Mechanics (Three questions to set)**

Generalised co-ordinates, constraints (Holonomic & nonholonomic), D'Alembert's principle and Langrage's equations of motion, Hamilton's equation of motion and their simple applications.

Lagrangian for a free particle and for a system of particles, Hamilton's

principle, Calculus of variation, Euler - Lagrange's equation, Principle of Least Action, Conservation theorems and symmetry properties, Application of Hamiltonian dynamics to simple problems, charged particle in an electromagnetic field (non-relativistic and relativistic cases), Laws of motion of rigid bodies, canonical transformation, Examples of canonical transformation, Poisson Brackets, Jacobi Identity.

ProceSSIONAL motion : Top and gyroscope.

Group C

Quantum Mechanics (Five questions to set)

Rise and fall of Planck - Bohr quantum Theory, Duality of radiation and matter, deBroglie's hypothesis, justification for the relation, $\lambda = h/p$, experimental confirmation.

Phase and group velocities of a wave, formation of a wave packet illustrations, Uncertainty principle, relating to position and momentum, relating to energy and time; applications.

General equation of the wave propagation, Propagation of matter waves, Time dependent and time independent schrodinger equations, Physical meaning of ψ .

Simple one - dimensional problem; particle in a box, concept of a potential - well, Linear Harmonic oscillator.

Operators : Eigenvalues and eigenfunctions, Linear operators, Product of two operators, Commuting and non-commuting operators, Simultaneous eigenfunctions, Orthogonal functions, Hermitian operators and their eigen values.

Orbital angular momentum, Operators for its Cartesian components, Commutation relation, mutual as well as with L^2 , Operators L^+ and L^- , Eigen values for L^2 and L_z .

Books Recommended :-

1. B. S. Rajput - Mathematical Physics

2. **Goldstein** - Classical Mechanics
3. **Puranik and Takwale** - Introduction to Classical Mechanics
4. **L. I. Schiff** - Quantum Mechanics
5. **Powell and Crasemann** - Quantum Mechanics
6. **Loknathan** - Quantum Mechanics
7. **P. T. Mathews** - "Quantum Mechanics"

PHYSICS (HONOURS)

Paper VI

(Solid State Electronics)

Time - 3 hours

Full Marks - 100

Twelve questions to be set. Six to be answered (taking atleast two from each group)

Group A

Solid State Physics (Six questions to be set)

Crystal geometry : Crystal lattices; Crystals planes and Miller indices. Unit cells, Typical crystal structures of NaCl, CaCl and diamond.

Crystallography : Diffraction of X-rays by a crystal lattice, Laue's formulation of X-ray diffraction; Reciprocal lattice, Brillouin zones, Laue spots, Interaction of Neutrons and electrons with matter.

Binding : Types of binding in solids : Covalent binding, Ionic binding, energy of binding, transition between covalent and ionic binding, metallic binding, Van der Waals binding.

Metal : Free electron theory of metals, Heat capacity of electron gas, electrical conductivity of metals, Boltzmann Transport equation, Sommerfeld theory of electrical conductivity, Band theory of solids, Bloch's theorem, Kronig-Penny model.

Group B

Circuit Theory & Semi-Conductor Devices

(Six questions to be set)

Circuit theory : Superposition theorem, Thevenin, Norton and Reciprocity Theorem.

Maximum power transfer theorem, One and two port networks, T and Π

equivalence of two port network, Filters (Low, High and Band Pass)
Semi-Conductor Diodes : p-n junction diode and its application in rectifiers, Clippers and limiters, Zener diode and its applications.

Bipolar Junction Transistor : Active and saturation regions, Two port analysis of a transistor, definition of h-parameters, Loadline concept, Emitter follower, Biasing methods.

Field Effect Transistor : Classification of various types of FET, JFET and its drain characteristics, Idea of MOSFET.

Amplifier : R. C. Coupled amplifier (Two stage), Feedback amplifier, Push-pull amplifier.

Oscillators and Wave form generators : Positive feedback, Barkhausen criterion, RC oscillator, Phase shift oscillator, Colpitt's oscillator, Hartley oscillator, Astable Multivibrator.

Books Recommended :-

1. **Terman** - "Radio Physics and Electronics"
2. **Loele** - "Thermionic Emission"
3. **Ryder** - "Network Lines and Fields"
4. **Mortor and Shade** - "Electronic Circuit and Devices"
5. **Malvino** - "Principle of Electronics"
6. **Bhandari and Kakani** - "Principle of Electronics"
7. **A. J. Dekker** - "Solid State Physics" (Prentice -Hall, 1957)
8. **H. J. Goldomid** - "Problems in Solid State Physics" (Pion, 1968)
9. **C. Kittel** - "Introduction to Solid State Physics" (Wiley, V.Ed. 1976)
10. **J. P. McKelvey** - "Solid State and semiconductor Physics" (Krieger, 1992)
11. **Saxena, Gupta and Kumar** - "Solid State Physics"
12. **S. L. Atmann** - "Band Theory of Metals, The Elements" (Pergamon Press, 1970)
13. **A. P. Malvino** - "Digital Principles and applications", Fourth Edition (International Students Edition)

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PHYSICS (HONOURS)

Paper VII

**(Electromagnetic Theory, Electrodynamics,
Statistical & Atomic Physics)**

Time - 3 hours

Full Marks - 100

Twelve questions to be set. Six to be answered (taking atleast one from each group)

Group A

Electromagnetic Theory & Electrodynamics

(Three questions to be set)

Maxwell's Equations and electromagnetic waves : Plane wave solution for Maxwell's equation, Orthogonality of E, B and Propagation vector, Poying vector, Energy and momentum propagation, Reflection and transmission at dielectric boundaries, Normal incidence, Oblique incidence, Polarization by reflection.

Retarded and advanced potentials, Field due to an oscillating current elements and oscillating dipole, Lienard-Wiechert potentials.

Group B

Plasma Physics (Two questions to be set)

Microscopic and macroscopic properties of plasma, plasma oscillations, Debye's Potential, Wave propagation in isotropic plasma, Ionospheric reflection, Pinch effect, Alfvén wave.

Group C

Statistical Physics (Four questions to be set)

The Statistical basis of thermodynamics : Probability and thermodynamic probability, Principle of equal a priori probability, Probability distribution, Probability and entropy, Boltzmann entropy relation.

Partition Function and its conversion to Thermodynamic functions, Sackur equation and Gibb's Paradox.

Ensembles : Micro-canonical, Canonical and Grand canonical ensembles,

Simple application of ensemble, Theory of Perfect gas, Fluctuations. Transition to Quantum Statistics : Degeneracy, Bose-Einstein distribution, Fermi-Dirac distribution and their simple applications. Sha's theory of ionisation, First and second order phase transition, Ising model, Critical exponent.

Group D

Physics of Atoms & Molecules (Three questions to be set)

Bohr-Sommerfeld theory of Hydrogen atom, Spectra of alkali and alkaline earth metals, Selection rules, Ionization potential, Fine Structure, Stern-Gerlach Experiment, Vector model of atom, Zeeman effect and Paschen Back Effect of a single valence atom, Mosley's Law, Origin of X-ray spectra.

Rotational Vibrational spectra of diatomic molecules, Rotation vibration and electronic bands, Isotopes effect on rotational and vibrational energies.

Books Recommended :-

1. **S. N. Sen** - "Plasma Physics"
2. **B. S. Tanenbaum** - "Plasma Physics"
3. **F. F. Vhen** - "Introduction to "Plasma Physics"
4. **N. A. Rail & A. W. Trivelpiece** - Principles of "Plasma Physics"
5. **Acossta and others** - "Essential of Modern Physics"
6. **A. Beiser** - "Concept of Modern Physics"
7. **D. J. Griffiths** - "Introduction to Electrodynamics" (Prentic-Hall of India, 1989)
8. **Reitz and Milford** - "Introduction to Electrodynamics" (Addision-wesley)
9. **G. Herzberg** - "Atomic spectra and atomic structure"
10. **H. Kuhn** - "Atomic Spectra"
11. **Walker and Straugha** - "Spectroscopy, Vol I, II, III"
12. **H. Herzberg** - "Molecular spectra and Molecular Structure"
13. **H. Barrow** - "Theory of atomic spectra"
14. **R. K. Pathria** - "Statistical Mechanics" (Pergamon Press)
15. **Kittel** - "Elements of Statistical Mechanics"
16. **White** - "Atomic Spectra"

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PHYSICS (HONOURS)
Paper VIII
PRACTICAL

Time - 6 hours

Full Marks - 100

The course shall include the following experiments. Examinees will have to perform two experiments selecting one from each group.

Group A

(Expt.- 30, viva-12, NB- 8)

1. Michelson's interferometer.
2. Studying the diffraction of light at a single aperture.
3. Fresnel diffraction at a straight edge and a slit.
4. Fraunhofer diffraction at a single slit.
5. Resolving limit of grating and prism.
6. Study of polarisation of light by simple reflection.
7. Study of optical rotation by solutions (using a vertical setup for easy change of length and a simple polaroid pair to avoid distraction).
8. Spectrum of atomic hydrogen and Rydberg constant.
9. Searl's apparatus (Newton's Ring)
10. Y of metal using Carnne's Fringes.

Group B

(Expt.- 30, viva-12, NB- 8)

1. Studying the parameters of a given laser.
2. Study of Thermionic emission.
3. Obtaining B-H curve for a ferromagnetic sample (any method).
4. Hall probe in magnetic field measurement.
5. Temperature dependence of conductivity of a semiconductor.
6. MOSFET characteristic curves.
7. UJT characteristic curves.
8. Photodiode characteristics.
9. Priliminary experiments with laser.
10. Band gap of semi-conductor diode.

CHEMISTRY (HONOURS)**Paper V****PHYSICAL CHEMISTRY****Time - 3 hours****Full Marks - 100**

Ten questions to be set. Five questions to be answered. Short answer type questions are recommended. There may be several parts in a question. The syllabus consists of following units :-

UNIT - I

8 Hrs

QUANTUM CHEMISTRY

Application of S.W.E. to free particle, Particle in one and three dimensional boxes, Degeneracy.

S.W.E. for H-atom. Separation into r , θ and ϕ equation without derivation Quantum numbers, Radial and angular wave functions and plots, Concept of electronic spins.

L.C.A.O. Principle, M.O. Theory, Criteria for forming M.O. from A.O., H_2^+ ion, Physical picture of bonding and antibonding M.O. wave functions, concept of σ , σ^* , π & π^* orbitals and their characteristics, Introduction to valence bond model of H_2 (qualitative).

UNIT - II

15 Hrs

CHEMICAL THERMODYNAMICS

Concept of free energy, Gibbs & Helmholtz free energies, their variation with temp., pressure and volume, Maxwell's relations, G.H. equation, Criteria for reversible and irreversible processes, Thermodynamics of phase transitions, Clapeyron-Clausius equation, Reaction Isotherm, Reaction isochore, Thermodynamic equation of state, Thermodynamic derivation of law of mass action, An introduction to partial molar quantities, Chemical potential, Gibbs Duhem equation, Fugacity, activity and activity coefficient.

UNIT - III

12 Hrs

ELECTRO CHEMISTRY

Nernst equation, Standard electrode potential, Free energy and E.M.F. of cell., Application of E.M.F. measurements, Potentiometric Titrations, Concentration cells with and without transference, Liquid Junction

potential and its elimination.

Commercial cells, Dry cell, Acid and alkali storage cells, Ionic strength, D.H. limiting law equation (qualitative), D.H. Theory of Mean activity coefficient (qualitative) of Ions in electrolytic solutions.

UNIT - IV

16 Hrs

THEORIES OF REACTION RATES

Collision theory of bimolecular reaction and its validity, Lindemann theory of unimolecular reaction, Transition state theory, Qualitative description of fluorescence, Phosphorescence and photosensitisation.

UNIT - V

6 Hrs

PHYSICAL PROPERTIES AND MOLECULAR STRUCTURE

Optical activity and chemical constitution, Parachore, Macleod's relationship and molecular structure, Molecular refraction, Polarisation, Clausius-Mossotti equation, Dipole moment and str. of molecules.

UNIT - VI

6 Hrs

MOLECULAR SPECTROSCOPY

Quantisation of molecular energies, spectral parameters, Types of molecular spectra.

a. Rotational Spectrum :-

Rigid rotor model, Energy levels, Selection rules, Spectral intensity, Non-rigid rotor, Isotopic effect, Applications of rotational spectra.

b. Vibrational Spectrum :-

Harmonic Oscillator

Rigid rotor approximation

Selection rule, Intensity, Anharmonicity, Modes of Vibrations, Characteristic group frequency, Vibrational modes of H_2O , NO_2 , N_2O & CO_2 .

Application of I.R. Spectra.

c. Electronic Spectrum :-

Concept of potential energy curves for bonding and antibonding M.Os selection rules.

Frank Condon Principle

Application of U.V. - Visible Spectra.

RESONANCE SPECTROSCOPY

Principle of Resonance Spectroscopy.

a. **Magnetic resonance spectroscopy :-**

Nuclear spin system, Nuclear spin quantum number, Nuclear spin angular momentum, Nuclear magnetic momentum, Nuclear magneton, Effect of magnetic field on system with nuclear spin, Nuclear energy levels, Separation and resonance condition in a magnetic field, Chemical shift, Factors affecting chemical shift, Nuclear spin coupling, Coupling constant, Applications of N.M.R. Spectra.

b. **Electron Spin Resonance Spectroscopy :-**

Electronic Spin System

Electronic spin quantum number, Electronic spin angular momentum, E.S. magnetic moment, Bohr magneton, E.S. energy levels, Separation between energy level caused by magnetic field. Conditions for E.S.R., Selection rule

Hyperfine coupling constant, E.S.R. spectra of H, CH₃, CH₂OH, NO, C₆H₅.

Applications of E.S.R. Spectra.

CHEMISTRY (HONOURS)**Paper VI****INORGANIC CHEMISTRY**

Time - 3 hours

Full Marks - 100

Ten questions to be set. Five questions to be answered. Short answer type questions are recommended. There may be several parts in a question. The syllabus consists of following units :-

UNIT - I

8 Hrs

MOLECULAR ORBITAL AND V.B. METHODS

Principles of linear combination, Energy and probability plots of bonding and antibonding MO of H₂⁺, Energy versus internuclear in H₂ both for attractive and repulsive states, Non-bonding M.O., V.B. wave functions of H₂ molecule, Comparison between V.B. & M.O. theory, Metallic bond, Band theory.

UNIT - II

11 Hrs

Types of magnetic behaviour, Paramagnetic susceptibility and methods

of its determination, Variation of magnetic susceptibility with Temp. Curie and Neel Temp. ground terms symbols and Hunds rule, Dependence of magnetic moment value on L, S and J-quantum numbers, Spin only magnetic moment, Quenching of orbital angular momentum.

UNIT - III

8 Hrs

METAL LIGAND BONDING IN TRANSITION METAL COMPLEXES

V.B. model of M-L bonding and its limitations, C.F. Model and splitting of d-orbitals in Oct. and Tetrahedral fields, Factors affecting the C.F. splitting parameter, C.F.S.E. Magnetic properties and colour of complexes.

UNIT - IV

8 Hrs

NUCLEAR CHEMISTRY

Nuclear stability and binding energy, Nuclear fission and fusion, Liquid drop model, Nuclear chain reaction, Moderator, Nuclear shell model, Magic number, Isotope effect and Isotope exchange reactions.

UNIT - V

7 Hrs

TRANSITION METAL COMPLEXES

Types of electronic transitions, Selection rule for electronic transitions, Spectro Chemical series, Free Ion ground terms and Orgel diagram for d^1 to d^9 system in Oct. & Tet. fields, Hole formalism, Discussion of electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ Ion, Ores and extraction of V, Mo and Pt -metals.

UNIT - VI

7 Hrs

HARD AND SOFT ACIDS BASES

Classification of acids and bases as hard and soft acids and bases, HSAB concept, Theory of hardness and softness, Electronegativity and hardness and softness.

UNIT - VII

10 Hrs

ORGANO METALLIC CHEMISTRY

Definition, Classification of organometallic compounds Prep. Properties, Bonding applications of alkyls and aryl of Zn, Nature of bonding in metal carbonyls, Zeiscels Salt.

UNIT - VIII

5 Hrs

BIO-INORGANIC CHEMISTRY

Essential and trace elements in biological processes K, Na, Mg, Fe,

Ca

Haemoglobin and Myoglobin, Nitrogen fixation.

CHEMISTRY (HONOURS)**Paper VII****ORGANIC CHEMISTRY****Time - 3 hours****Full Marks - 100**

Ten questions to be set. Five questions to be answered. Short answer type questions are recommended. There may be several parts in a question. The syllabus consists of following units :-

UNIT - I

9 Hrs

ORGANIC REACTION MECHANISM

Mechanism and stereochemistry of nucleophilic substitution reaction viz, SN^1 , SN^2 and SN^i , Relative reactivities of alkyl halides, allyl, vinyl and aryl halides, Solvent effect, α and β elimination reactions, E^1 and E^2 - mechanism and their regio and stereo-selectivities, Electrophilic additions to C-C multiple bonds, Nucleophilic addition to C=O bond.

UNIT - II

11 Hrs

SYNTHETIC REACTIONS AND MOLECULAR REARRANGEMENT

Mechanism and applications of the following reactions

- a. Diels-Alder reaction
- b. Kolbe reaction
- c. Baeyer-Villiger Oxidation
- d. Mannich reaction
- e. Micheal Addition reaction
- f. Beckmann rearrangement
- g. Hofmann rearrangement
- h. Wolf rearrangement
- i. Pinacol-Pinacolone rearrangement
- j. Wagner-Meerwein rearrangement
- k. Fries-rearrangement

UNIT - III

11 Hrs

SYNTHETIC REAGENTS

$LiAlH_4$, $NaBH_4$, N-Bromo-succinimide Al-Isopropoxide, Per Iodic acid, Lead Tetraacetate, Osmium tetroxide, Raney Ni and SeO_2 .

UNIT - IV

8 Hrs

POLY NUCLEAR HYDROCARBONS

Synthesis, Properties and structure determination of Naphthalene, Anthracene, Phenanthrene, Synthesis of some important compounds of above polynuclear hydro carbons.

UNIT - V

12 Hrs

HETEROCYCLIC COMPOUNDS

Introduction, Classification and nomenclature

- Five membered heterocycles-pyrrole, Furan & thiophene Synthesis, Properties and aromaticity.
- Six membered heterocycles, Pyridine & Pyrones Synthesis, Properties and aromaticity.
- Condensed heterocycles - Quinoline, Isoquinoline, Indole and Benzofuran-Synthesis, properties and aromaticity.

UNIT - VI

10 Hrs

SYNTHETIC DYES

Classification, Correlation of colour with constitution, Chemistry and Synthesis of methyl orange, Congo red, Methyl red, Green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

UNIT - VII

18 Hrs

BIOMOLECULES

Classification, Structure and Stereochemistry of amino acids, Acid-base nature, Isoelectric point and electrophoresis, Preparation and reactions of α amino-acids, Peptide linkage, Peptide, Synthesis, Structure and nomenclature of peptide and proteins, Classification of proteins, Constituents of nucleic acids, Purine and pyrimidine bases, Ribonucleosides and ribonucleotides, Double helical structure of DNA.

UNIT - VIII

12 Hrs

SYNTHETIC POLYMERS

Addition polymerisation, Free radical Vinyl Polymerisation, Ionic Vinyl Polymerisation, Ziegler-Natta Polymerisation condensation or step growth polymerisation, Preparation and application of following polymers.

Polyester, Poly amides, Polyacrylates, rayon, Polyolefines, Polyurethanes, Plasticisers, Biodegradable polymers.

Time - 6 hours

Full Marks - 100

(A) Physical Chemistry :-

1. Determination of molecular weight of a non-volatile solute.
2. To determine the viscosity of a liquid
3. To determine the percentage composition of a given mixture by viscosity method.
4. To determine the Surface Tension of a liquid.
5. To determine the distribution Coeff. of I_2 between water and CCl_4 .
6. To determine the water equivalent of Calorimeter.
7. To determine the heat of neutralization of a strong acid (HCL) with strong base (NaCl)
8. To determine the specific rate constant of hydrolysis of methyl acetate catalysed by H^+ ion at room temp.

(B) One experiment of 30 marks from either Inorganic or Organic Chemistry :

a. Inorganic Chemistry :-

Preparation of the following compounds :-

- (i) K-Trioxalato Chromate (III)
- (ii) Chrome alum
- (iii) Mohr's salt

b. Organic Chemistry :-

- (i) Separation of green leaf pigments using TLC & CCG.
- (ii) Stereochemical study of organic compounds via models.
 - (a) R & S - configuration of optical isomers
 - (b) Conformational analysis of Cyclohexanes & monosubstituted derivatives.

(C) NB + Viva Voce

20 Marks

**Books for Chemistry (Hons)
Part - I + Part II + Part III (Theory)**

PHYSICAL CHEMISTRY

1. Physical Chemistry *by* P. C. Rakshit
2. Physical Chemistry *by* Puri-Sharma & Pathania
3. Physical Chemistry *by* Kapoor
4. Physical Chemistry *by* Barrow
5. Physical Chemistry *by* P. W. Atkins
6. Physical Chemistry *by* Gurdeep Raj

INORGANIC CHEMISTRY

1. Concise Inorganic Chemistry *by* J. D. Lee
2. Basic Inorganic Chemistry *by* Cotton & Wilkinson
3. Inorganic Chemistry *by* Puri and Sharma
4. Inorganic Chemistry *by* Gurdeep Raj.

ORGANIC CHEMISTRY

1. Organic Chemistry *by* Bahl and Bahl
2. Organic Chemistry *by* I. L. Finar
3. Reactions and Reagents *by* O. P. Agrawal
4. Organic Chemistry *by* M. K. Jain
5. Reaction Mechanism *by* Parmar and Chawla
6. Reaction Mechanism *by* Potre Sykes

**Books Suggested for lab. Course
Part - I (Hons) Chemistry**

1. Vogel's Qualitative Inorganic Analysis - Orient Longman
2. Vogel's Quantitative Inorganic Analysis - ELBS
3. Practical Chemistry *by* T. Sharma and B. N. Jha

Part - II (Hons) Chemistry

1. Vogel's Qualitative Inorganic Analysis
2. Vogel's Quantitative Inorganic Analysis
3. Practical Chemistry *by* T. Sharma and B. N. Jha

Part - III (Hons) Chemistry

1. Experiments in Physical Chemistry - J. C. Ghose (Bharti Bhawan)
2. Practical Chemistry *by* T. Sharma and B. N. Jha

MATHEMATICS (HONOURS)**Paper V****Time - 3 hours****Full Marks - 100**

Twelve questions to be set. Six to be answered selecting at least one from each group.

Group A**REAL ANALYSIS (Six questions)**

Riemann integral, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorem on integral calculus.

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's test, Frullani's integral, Integral as a function of a parameter, Continuity, Derivability and integrability of an integral of a function of a parameter, Series of arbitrary terms, Convergence, Divergence and Oscillation, Abel's and Dirichlet's 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 piece wise monotonic functions.

Group B**COMPLEX ANALYSIS (Three questions)**

Complex numbers as ordered pairs, Geometric representation of complex nos. stereographic projection, Continuity and differentiability of complex functions, Analytic functions, Cauchy's Riemann equations, Harmonic functions, Elementary functions, Mapping by elementary functions, Mobius transformation, Fixed Points, Cross ratio, Inverse Points and Critical mappings, Conformal mappings

Group C**METRIC SPACE (Three questions)**

Definition and examples of metric spaces, Neighbourhood limit points, Open and closed sets, Closure, Interior and Boundary points, Subspace of metric space, Cauchy's 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, Dense subsets.

References :-

1. R. V. Churchill & J. W. Brown - Complex variable and applications(5th edition) McGraw Hill, New York, 1990
2. Shanti Narayan - Theory of functions of complex variable, Schand & Co., New Delhi
3. Shanti Narayan - A course of Mathematical Analysis, Schand & Co., New Delhi
4. E. I. Copson - Complex Variable
5. E. I. Copson - Metric Spaces, Cambridge, University, Press, 1968
6. P. K. Jain and K. Ahmad - Metric Space, Narosa Publishing House, New Delhi
7. G. F. Simmons - Introduction to Topology & Modern Analysis McGraw Hill, 1963
8. S. Lang - Undergraduate Analysis, Springer, Verlag, New York, 1983
9. P. K. Jain and S. K. Kaushik - An introduction to Real Analysis, S. Chand & Co.
10. D. Somasundram and B. Choudhary - A first course in Mathematical Analysis, Narosa Publishing House, New Delhi
11. T. M. Apostol - Mathematical Analysis, Narosa Publishing House, New
12. R. R. Goldberg - Mathematical Analysis, Oxford & IBH Publishing Co., New Delhi

MATHEMATICS (HONOURS)**Paper VI****Time - 3 hours****Full Marks - 100**

Twelve questions to be set. Six to be answered selecting at least one from each group.

GROUP THEORY**Group A****ABSTRACT ALGEBRA (Three questions)**

Auto morphisms, Inner automorphism, Automorphism groups and their computations, Conjugacy relation, Normaliser, Counting principle and

the class equation of a finite group, Centre for group of prime order, Abellainizing of a group and its universal property, Sylow's theorems, P-sylow, Sub group, Structure theorem for finite abelian groups.

Group B

RING THEORY (Three questions)

Ring theory- Ring homomorphism, Ideals and quotient Rings, Field of Quotients of an integral domain, Euclidean Rings, Polynomial Rings, Polynominals over the Rational field, The Eienstin Criterion, Polynomial rings over commutaive rings, Unique factorization domain, R unique factorization domain multiples so in $[x_1 \times x_2 \dots x_8]$.

Group C

LINEAR ALGEBRA (Four questions)

Definition and examples of vector spaces, subspaces, sum and direct sum of subspaces, Linear span, Linear dependence, Independence and other basic properties, Basic, Finite, Dimensional vector spaces, Existance of complementary subspace of a finite dimensional vector spaces, Dimension of sums of subspaces, Quotient space and its dimension, Linear transformations and their representation as matrices, The rank nullity theorem, Change of basis, Dual space, Bidual space and natural Isomorphism, Adjoint of a linear transformation, Eigen values and Eigen vectors of a linear transformation, Diagonalisation, Annihilator of a subspace.

Group D

LINEAR FUNCTIONALS & MODULES (Two questions)

Bilinear, Quadractic and Hermitian forms, Modules, Submodules, Quotient modules, Homomorphism and Isomorphism theorems.

References :-

1. N. Jacobnson - Basic Algebra, Vol I & II, W.H. Freeman, 1980
2. Shanti Narayan - A text book of Modern Abstract Algebra, S. Chand & co.
3. J. S. Luther and I. B. S. Passi - Algebra Vol I, Groups and rings Vol II Narosa Publishing House, New Delhi (Vol I- 1996, Vol- II. 1999)
4. D. S. Malik, J.N. Mordeson & M.K. Sen - Fundamentals of Abstract Algebra McGraw Hill International Edition

5. S. Kumar Sen - Linear Algebra, A Geometrical Approach, Prentice Hall of India, 2000
6. A. R. Varbulla - A Linear Algebra
7. I. N. Hertein - Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1995
8. K. B. Dutta - Matrix and Linear Algebra, Prentice Hall of India, 2000
9. P. B. Bhattacharya, S.K. Jain & S.R. Nagpal - Basic Abstract Algebra (2nd edition) Cambridge University Press Imrainedition, 1997

MATHEMATICS (HONOURS)

Paper VII

Time - 3 hours

Full Marks - 100

Twelve questions to be set. Six to be answered selecting at least one from each group.

Group A

STATICS (Three questions)

Analytic conditions of equilibrium of coplaner forces, Virtual work, Catenary, Forces in three dimensions, Poinso't's Central axis, Wrenches, Null lines and Planes, Stable and Unstable equilibrium

Group B

DYNAMICS (Five questions)

Velocities and accelerations along radial and transverse directions and along tangential and normal directions, Simple Harmonic motion, Elastic strings, Motion in a resisting medium, Motion of particles of varying mass, Central orbit, Kepler's laws of motion, Motion of a particle in three dimensions, Application in terms of different coordinate systems, Moments and products of Intertia, The momental ellipsoid, Equimomental systems, Principal axis, D'Alembert's principle, The general equation of motion of a rigid body, Motion of the Centre of Inertia and Motion relative to Centre to Inertia, Motion about a fixed axis, The compound pendulum, Centre of percussion, Motion of a rigid body in two dimensions under finite and impulsive forces, Conservation of Momentum and Energy, Lagrange's equation, Initial Motions.

Group C

HYDROSTATICS (Four questions)

Pressure equation, Condition of equilibrium, Lines of force, Homogeneous and Hetrogeneous fluids, Elastic fluids, Surface of equal pressure, Fluid at rest under action of gravity, Rotating fluids, Fluid Pressure on Plane surfaces, Centre of pressure, Resultant Pressure on curved surfaces, Equilibrium of floating bodies, Meta-centre, Work done in producing a displacement, Vessels containing liquid.

Gas laws, Mixture of gases, Integral energy, Adiabatic expansion, Work done in compressing gas, Isothermal atmosphere, Connective equilibrium.

References :-

1. S. L. Loney - Statics, Macmillan & Comp., London
2. R. S. Verma - A text book of Statics, Poltershala Pvt. Ltd., Allahabad
3. S. L. Loney - An elementary treatise on the dynamics of a Practics & Rigid body
Cambridge University Press, 1956
4. A. S. Ramsey - Dynamics Part -I, Cambridge University Press, 1973
5. W. H. Besant and - A Treatise on Hydromechanics
A. S. Ramsey Part - I Hydrostatics, ELBS and G. Bell & Sons Ltd., London

MATHEMATICS (HONOURS)**Paper VIII (OPTIONAL PAPER)****THEORY OF NUMBERS****Time - 3 hours****Full Marks - 100**

Twelve questions to be set. Six to be answered selecting at least one from each group.

The Basic Representation Theorem (Four questions)

Linear Diophantine equations, Fundamental theorem of Arithimatic, Fermat's little theorem and Wilson's theorem.

Basic Properties of Congruences (Five questions)

Residue System, Euler's theorem, Multiplicative Arithmetics functions, The function $u(n)d$ and their simple properties and mobius inversion formula primitive root modulation, Elementary properties of π , Legendre's

formula for the highest power of a prime number that divided $n-1$, Statement of prime number theorem, Euler's criterion for quadratic residue, The Legendre symbol, The quadratic reciprocity law and application

(Three questions)

Sums of two and four squares, Fermat's conjecture, Graphical representation of partitions, Euler's partition theorem.

Books recommended :-

1. Hardy and Wright - Number Theory
2. Dickson - Number Theory
3. Malick - Number Theory

MATHEMATICS (HONOURS)

Paper VIII (OPTIONAL PAPER)

SPEHERICAL ASTRONOMY

Time - 3 hours

Full Marks - 100

Twelve questions to be set. Six to be answered selecting at least two from each group.

Group A

SPEHERICAL TRIGONOMETRY (Four questions)

Spherical triangle, Definitions, Fundamental formula (Cosine, Sine, Sine-Cosine, Cotangent), Napier's and Delambre's Analogies, Right angle triangle and Napier's rule.

Group B

SPEHERICAL ASTRONOMY (Eight questions)

Celestial sphere, Definition, Different systems of co-ordinates, phenomenon of rising and setting of stars, Twilight, Transit instruments, Error and their corrections, Solar System, Two body problem, Equation of relative motion, Area integral, Kepler's second law, Energy integral, Laplace integral, Anomalies, Kepler's equation, Stationery points, Phase of planets, Refraction in the position of a body, Annual Aberration, Effect of the aberration on right ascension and declination, Parallax effect of parallax on latitude, Right ascension and declination.

Books recommended :-

1. G. S. Malick - Spherical Astronomy
2. Gorakh Prasad - Spherical Astronomy
3. Ramchandran - Spherical Astronomy

BOTANY (HONOURS)**Paper V****Time - 3 hours****Full Marks - 100**

Ten questions to be set. Five questions to be answered. Question No. 1 will be of objective type and compulsory.

BIOLOGY OF SEED PLANTS

Phanerogams, the seed bearing plants : General characteristics and types.

Gymnosperms : General characters, Ontogeny and structure of seed, Microsporogenesis and male gametophyte, The ovule and megasporogenesis, Female gametophyte, Pollination, Fertilization, Embryogeny and maturation of seed.

The Coniferales : General organography and anatomy, Foliage leaves, Strobili and sporangia, Reproductive cycle - sporogenesis, gametophytes, Fertilization, Embryogeny and seed development of *Pinus* and *Taxus*

The Gnetales : Habit and distribution, Vegetative organography and anatomy, Reproductive cycle - strobili, sporogenesis, male & female gametophytes, Pollination, Fertilization and embryogeny.

Flower : Evolution, Concept of flower as a modified determinate shoot, Genetic control of floral organs, Functions of flower.

Structure of anther : Microsporogenesis, Formation of pollen grains (male gametophyte), Pollen germination, Pollen tube growth.

Structure of pistil : Ovules, Megasporogenesis, Development of embryo sac (female gametophyte)

Mechanisms and agencies of Pollination : Pollen-stigma interaction, Self-incompatibility, Double fertilization, Apomixis.

Seed and fruit : Development of endosperm and embryo in monocotyledons and dicotyledons, Storage of reserve materials and desiccation in seeds, Dormancy and seed germination, Fruit maturation, Ripening and dispersal.

BOTANY (HONOURS)**Paper VI****Time - 3 hours****Full Marks - 100**

Ten questions to be set. (Four questions from Group A and Five from Group B). Five questions to be answered selecting not more than two from each group. Question No. 1 will be of objective type and compulsory.

MICROBIOLOGY AND PLANT PATHOLOGY**Group A****MICROBIOLOGY**

1. **Discovery of microorganisms** : Systematic position of microorganisms in biological world, Classification of microorganism and characteristic features of different groups.
2. **Methods of microbiology** : Basic principles of microscopy, Micro-metry, Staining, Sterilization methods, Culture media, Pure culture methods, Methods for population estimation, Growth determination.
3. **Ultrastructure of microorganisms** : Prokaryotic microorganisms, Fine structure of prokaryotic cell, Eukaryotic microorganisms, Viruses properties and classification, Characteristic features of host-virus interaction, Bacteriophage T4, Tobacco mosaic virus, General account of mycoplasma and actinomycetes.
4. **Genetic recombination in prokaryotes** : Conjugation, Transformation and transduction.
5. **Role of microorganisms in biogeochemical cycling of nitrogen and carbon** : Biological N₂ fixation.
6. **Industrial application of microorganisms** : Organic acids, Alcohol, Food processing, Milk products, Antibiotics and biopesticides.

Group B**PLANT PATHOLOGY**

7. **General account of Plant pathogens** : Historical developments, General account of diseases caused by plant pathogens.
8. **Pathogen attack and defense mechanism** : Physical, Physiological, Biochemical and molecular aspects.
9. **Plant disease epidemiology** : Transmission and spread of plant pathogens, Disease cycles, Epidemics, Modeling and disease forecasting.
10. **Plant disease management** : Chemical, Biological, IPM systems, Development of transgenics, Biopesticides, Plant disease clinics.
11. **Genetics of resistance and susceptibility** : Genes for virulence and a virulence, their application in resistance and susceptibility. Induced resistance (immunization).
12. **Molecular Plant Pathology** : Molecular diagnosis, Identification of genes and specific molecules in disease development, Molecular manipulation of resistance.

13. **Plant disease** : Black rust of wheat, Citrus Canker, Little leaf of Brinjal, Wilt of Arhar, Loose Smut, Late blight of Potato, Tobacco mosaic, Red rot of Sugar cane.

BOTANY (HONOURS)

Paper VII

Time - 3 hours

Full Marks - 100

Ten questions to be set. (Five questions from Group A and four questions from Group B). Five questions to be answered. Question No. 1 will be of objective type and compulsory.

GENETICS AND PLANT BREEDING

Group A

GENETICS

Mendel's experiment and principle of inheritance : Backcross and test cross, Gene interactions and modified dihybrid ratios-complementary, supplementary, duplicate and epistatic factors.

Multiple Allelism : Multiple alleles in *Drosophila* (eye colour), man (blood groups) and plants (self incompatibility).

Linkage and recombination : Coupling and repulsion phases; two and three point test crosses with their significance in chromosome mapping, Interference and co-efficient of coincidence.

Sex chromosomes in *Drosophila*, Man and maleandrium : Balance concept of sex determination in *Drosophila*, Mechanisms of sex determination; Sex linked inheritance in *Drosophila* and man; Sex limited characters.

Maternal influence on inheritance : Shell coiling in snails and Kappa particles in *Paramecium*; Cytoplasmic inheritance in yeast (mitochondria) and, *Mirabilis jalapa* (plastids).

Alterations in the genetic make up - changes at genetic level: Spontaneous and induced mutations, Mutagens-types and mode of action, Transitions, Transversion and frame-shift mutations, Detection of mutations.

Alteration in genetic make up -changes in chromosome structure, Origin, types and effects of duplications, Deletions, Inversions and translocations; Meiosis in structural heterozygotes.

Alterations in genetic make up; changes in chromosome number : Origin, types and effects of auto and allopolyploidy, Origin and meiosis in nullisomics, Monosomics and trisomics, Plant Breeding.

Types of Plant reproduction : Vegetative, Sexual and apomixis,

their effect on generating and fixing genotypic variation.

Methods of plant improvement : Pure line and mass selection; hybridization in self and cross pollinated crops; introduction and acclimatization; hybrid vigour, Mutations and polypoidy as methods of plant improvement.

Biostatistics : Normal distribution, Mean, Mode, Median SD, SE, Chi-square.

Group B

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

GENE structure, expression and regulation : Gene organization in prokaryotes and eukaryotes; Operon concept, Gene regulation in prokaryotes and eukaryotes; Inducible, repressible, positive and negative gene regulation; Interrupted genes in eukaryotes, RNA splicing, mRNA stability.

Recombinant DNA technology : Restriction endonucleases; Prokaryotic and eukaryotic cloning vectors, Genomic and cDNA libraries; Southern, northern and western Blottings, Various techniques of gene mapping and DNA fingerprinting (RFLP, RAPD, AFLP); Chromosome walking, Polymerase chain reaction, DNA sequencing.

General acquaintance of Plant Biotechnology : With reference to cellular differentiation and totipotency; Organogenesis and embryogenesis; Protoplast isolation and culture; Somatic hybridization; Clonal propagation; Genetic engineering of plants; Vectors for gene delivery; Selectable markers and reporter genes; Methods of gene delivery, Agrobacterium - the natural genetic engineer; Salient achievements in crop biotechnology (with suitable examples) and prospects.

Botany(Honours)

Paper VIII

PRACTICAL

Time - 6 hours	Full Marks - 100
1. Angiosperm	- 20
2. Microbiology	- 10
3. Plant Pathology	- 10
4. Genetics & Plant Breeding	- 10
5. Bio-chemistry	- 10
6. Spotting	- 5×4= 20
7. Practical Record	- 10
8. Viva Voce	- 10

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ZOOLOGY (HONOURS)
Paper V

Time - 3 hours

Full Marks - 100

Ten questions are to be set. Question number **one** will be compulsory and objective (numbering 20, each of one mark) covering the whole syllabus of the paper. Students will be required to answer any **five** questions at least **One** question from each group.

Group A

Developmental Biology

1. Structure and types of eggs
2. Structure of sperm
3. Fertilization, parthenogenesis
4. Patterns of cleavage and laws of cleavage
5. Fate map and Cell lineage
6. Organizer concept and conduction process
7. Organogenesis of heart, eye and brain
8. Embryonic membranes in amniotes
9. Post embryonic development in insects and amphibians
10. Placenta in mammals
11. Regeneration in invertebrates and vertebrates
12. Growth
13. Ageing

Group B

Genetics & Immunology

1. Non-Mendelian inheritance & interactions of genes
2. Co-dominance and incomplete dominance
3. Linkage and Linkage maps
4. Varieties of gene expression and multiple allelism, lethal genes, pleiotropic genes
5. Sex-linked traits in Drosophila and man
6. Chromosomal basis of inheritance
7. Non-chromosomal inheritance
8. Mutation and Chromosomal aberrations
9. Human genetics - Chromosomal disorder, single gene disorders (metabolic error diseases)

Immune System -

10. Innate and Adaptive immunity
11. Cells, Tissue and Molecule of immune system
12. Antigen and Antibodies - Structure, types & interaction
13. MHC genes and gene products
14. Cytokines and Lymphokines
15. Autoimmunity and Immune disorder

ZOOLOGY (HONOURS)**Paper VI**

Time - 3 hours

Full Marks - 100

Ten questions are to be set. Question number one will be compulsory and objective (numbering 20, each of one mark) covering the whole syllabus of the paper. Students will be required to answer any five questions at least One question from each group.

Group A**Molecular Biology**

1. Organisation of DNA, Viral, bacterial, eukaryotic palindromes, split genes, transposons
2. DNA replication - principle, enzymes, inhibitors
3. DNA repair.
4. Transcription, translation (Synthesis of protein) - a basic detail
5. Co & post translational modification inhibitors
6. Regulation of genes expression - general principle
7. Gene transfer, gene therapy

Group B**Biotechnology**

1. Basic concept of genetic engineering
2. Enzymology of genetic engineering
3. Restriction enzyme, DNA ligase, polymerase
4. Cloning vehicle plasmid, cosmids, lambda-phage, Charonphage, Shuttle vectors, Yeast, Plasmid
5. Introduction of cloned genes into host cell, transformation, transduction, particle gun, Electroporation
6. Polymerase chain reaction, Ribosome, Northern blotting, Southern blotting, DNA finger printing, Antisense RNA
7. Gene Libraries - construction & analysis of cDNA, mRNA, cDNA

synthesis, Genome DNA libraries, YACs, BACs

8. Application & impact of rDNA technology

ZOOLOGY (HONOURS)

Paper VII

Time - 3 hours

Full Marks - 100

Ten questions are to be set. Question number **one** will be compulsory and objective (numbering 20, each of one mark) covering the whole syllabus of the paper. Students will be required to answer any **five** questions at least **One** question from each group.

Group A

Ecology

1. Population - Characteristic, growth and its analysis, Regulation of derivatives
2. Animal Association : Predation, parasitism, its evolution, commensalism and mutualism
3. Communities and ecosystem, ecosystem energetics
4. Biogeochemical cycles : nitrogen, carbon and phosphorous cycle
5. Concept of Biosphere
6. Ecological Succession
7. Wild-life management
8. Zoogeographical realms and their faunistic peculiarities
9. Environmental pollution of soil , air and water pollutants, pollution control strategies.
10. Toxicology - introduction, Types of toxic agents : pesticides, metals, solvents (hydrocarbons), carcinogens, radiations

Group B

Evolution

1. Principles of evolution - Lamarckism, Darwinism, Neo-Darwinism and Natural selection, Modern synthetic theory of evolution
2. Variation, Isolation, Selection, Speciation and their role in evolution
3. Fossil history of Horse and Man
4. Hardy -Weinberg law

Economic Zoology

5. Lac-culture
6. Seri-culture

7. Api-culture
8. Elementary idea of pests of crops

ZOOLOGY (HONOURS) Paper VIII

Practical

Time - 6 hours

Full Marks -100

(Expt.- 30, viva-12, NB- 8)

1. **Ecology** 1×20 = 20
 - Water holding capacity of soil and estimation of its water content
 - Study of plant-biota
 - Determination of dissolved O₂ and pH of different water samples
 - Community structure of grassland
2. **Molecular Biology Experimentation** 1×20 = 20
 - Centrifugation, cell fractionation
 - Spectrophotometric analysis of given sample
 - Thin layer chromatography
 - Gel electrophoresis
 - Northern blotting
 - Southern blotting
3. **Immunology & Genetics** 1×15 = 15
 - Antigen - antibody reaction - demonstration of antigen
 - Typing of blood group
 - Demonstration of Mendelian monohybrid & dihybrid ratio
 - Bar-body demonstration
 - Karyotype demonstration
 - Demonstration/analysis of dominant & recessive traits
 - Phenyl-thiocarbamide test (PTC test)
 - Pedigree analysis - detection of chromosomal defects
4. **Identification & Comments** 5×3 = 15
 - Embryological Slides :
 - Eggs of different types
 - Sperms of different types
 - Stages of cleavage, blastula, gastrula of frog and chick
 - Different developmental stages of frog and chick
5. **Practical Records** 15
6. **Viva-voce** 15

COURSES OF STUDY

for

**Commerce subjects/group of subjects
for B.Com (General) Part III Examination**

Time - 3 hours

Full Marks - 100

Paper VII**FUNCTIONAL MANAGEMENT**

- i. Financial Management - Concept and objective of Functional Management, Functions of Financial Manager, Financial Planning, Capital Structure, Source of raising funds, Management of Working Capital, Capital Market.
- ii. Human Resource Management - Role and responsibilities of Human Resource Manager, Human Resource Planning, Recruitment Selection, Training, Methods of Training, Job Evaluation, Compensation, Performance, Appraisal.
- iii. Marketing Management - Meaning and objectives of Marketing Management, Changing Concept of Marketing, Micro and Macro Environment, Marketing Mix and its Submixes.

Suggested Readings :

1. Prabandh Prashashan Avam Sangathan - Jain, Sahitya Bhawan, Agra.
2. Vipnan Prabandhan - Promod Kr. Agrawal, Ramesh Book Depot.

Paper VIII**COST AND MANAGEMENT ACCOUNTING**

- i. Computation of Cost - Concept of Cost, Elements of Cost, Components of Cost, Unit Costing, Contract Costing, Preparation of Reconciliation Statement.
- ii. Standard Costing - Meaning and Objective of Standard Costing, Variance Analysis, Computation of Material Variances.
- iii. Introduction - Meaning, nature and scope of Management and cost Accounting, management vs Cost Vs Financial Accounting, Tools and Techniques of Management Accounting.
- iv. Financial Analysis - Ratio Analysis, Fund Flow Statement, Cash Flow Statement, Uses in Financial decision making.
- v. Break Even Analysis - Concept and importance of Break Even Analysis, Break Even Point.

Suggested Readings :

1. Prasad Manmohan - Lagat Khate ki Bhumika, 2004 Motilal Banarasi Das, Patna

2. Prasad Manmohan & Sinha Kamini - Prabhandhkiya Lekhankan, Motilal Banarasi Das, Patna
3. Maheswari S.N. - Management Accounting and Financial Control, S. Chand, New Delhi
4. Ravi M. Kishore - Management Accounting, Taxman, New Delhi
5. Mehta B.K. - Lagat Lekhaankan, Sahitya Bhawan, Agra.
6. Pillai R.S.N. & Bagavathi V. - Cost Accounting, S. Chand & Co., New Delhi
7. Agrawal M.L. - Cost Accounting, Sahitya Bhawan Publications, Agra

Paper IX

BUSINESS STATISTICS

- i. Introduction - Statistics as a Subject, Nature and Scope of Statistics, Importance of Statistics in Business, Limitations of Statistics, Basics of Data.
- ii. Measures of Central Tendency - Definition, Objectives and kinds of Statistical Averages- Arithmetic Mean, Median, Mode, Harmonic Mean, Geometric Mean.
- iii. Measures of Dispersion - Objectives of Measuring Dispersion, Range, Inter Quartile Range and its co-efficient, Quartile Deviation, Mean Deviation, Standard Deviation, Co-efficient of Variation
- iv. Skewness, Moments and Kurtosis - Measures of Skewness, Karl Pearson's and Bowley's Co-efficient of Skewness. Moments and Kurtosis.
- v. Business Forecasting - Concept, Basis and Techniques of Business Forecasting, Main Theories of Forecasting, Industry vs Company Sales Forecasting, Utility and Limitations of Business Forecasting.

Suggested Readings :

1. Hooda, R.P. - Statistics for Business and Economics, Macmillan New Delhi
2. Lewin and Rubin - Statistics for Management, Prentice hall, New Delhi
3. Sanchiti and Kapoor - Statistics(Theory Methods and Application) Sultan Chand & Sons, New Delhi
4. Elhance, Elhance and Vaishya -Sankhiyaki Ke Sidhant, Kitab Mahal Publication
5. Singh, S.P - Sankhikiya Sidhant Avam Vyabhar, S. Chand & Co, Ltd., New Delhi.
6. Gupta B.N. - Sankhikiya Sidhant; SBPD, Agra

COURSES OF STUDY
for
for B.Com (Honours) Part III Examination
(A) ACCOUNTING & FINANCE GROUP

Time - 3 hours

Full Marks - 100

Paper V

FINANCIAL MANAGEMENT

- i. Introduction - Concept, Objectives and Coverage of Financial Management, Organisation of Finance Function, Role of Finance Manager.
- ii. Capital Structure - Concept and significance of Capital structure, Factors determining Capital Structure, Optimum Capital Structure.
- iii. Leverage - Meaning and Types of Leverage, Operating and Financial Leverage, Problems.
- iv. Capital Budgeting - Nature of Investment Decisions, Capital Budgeting Process, Investment Evaluation Criteria, Payback Period, NPV, IRR, Problems.
- v. Dividend Decision - Disposition of profits, Dividends, Retained Earnings, Pay-out Ratio, Problems.

Suggested Readings :

1. Pandet I.M. - Financial Management, Vikas Publishing House, New Delhi.
2. Maheswar S.N. - Financial Management, Sultan Chand & Sons, New Delhi
3. Kulkarni & Satyaprasad - Text Book of Financial Management, HPH, Bombay
4. Jha G.K & Jha D. - Fundamentals of Financials Management (in Press)
5. Agrawal, Kothari - Vittiya Prabandhan, Ramesh Book Depot
6. Kulshrestha R.S. - Financial Management, Sahitya Bhawan Publication Division, Agra

Paper VI

COST AND MANAGEMENT ACCOUNTING

- i. Computation of Cost - Concept of Cost, Elements of Cost, Components of Cost, Unit Costing, Contract Costing, Preparation of Reconciliation Statement

- ii. Standard Costing - Meaning and Objective of Standard Costing, Variance Analysis, Computation of Material Variances.
- iii. Introduction - Meaning, nature and scope of Management and cost Accounting, management vs Cost Vs Financial Accounting, Tools and Techniques of Management Accounting.
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- v. Break Even Analysis - Concept and importance of Break Even Analysis, Break Even Point.

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2. Prasad Manmohan & Sinha Kamini - Prabhandhkiya Lekhankan, Motilal Banarsi Das, Patna
3. Maheswari S.N. - Management Accounting and Financial Control, Sultan Chand, New Delhi
4. Ravi M. Kishore - Management Accounting, Taxman, New Delhi
5. Mehta B.K. - Lagat Lekhaankan, Sahitya Bhawan, Agra.
6. Pillai R.S.N. & Bagavathi V. - Cost Accounting, S. Chand & Co., Ltd., New Delhi
7. Agarwal M.L. - Cost Accounting, Sahitya Bhawan Publication, Agra

Paper VII INCOME TAX

- i. Introduction - Income Tax Act, 1961, Basic Concepts, Income, Agricultural Income, Assessment Year, Previous Year, Total Income, Assessee Person, Tax Planning.
- ii. Basis of Charge - Residence and Tax Liability, Income Exempted From Tax.
- iii. Heads of Income - Computation of Income from Salaries, House property, Profits and Gains of Business, Capital Gains, Other Sources.
- iv. Computation of Tax Liability - Computation of Total Income and Tax Liability of an Individual.
- v. Tax administration - Income Tax Authorities, CBDT, Filing of Return of Income.

Suggested Readings :

1. Singhaniya V.K. - Students Guide to Income Tax, Taxman Pub. Delhi (Hindi/English)
2. Prasad, Bhagoli - Income Tax : Law and Practice, Wailey Pub., New Delhi.
3. Mehrotra, H.C. - Ayakar : Vidhan Avam Lekha, Sahitya Bhawan, Agra
4. Girish Ahuja, ravi Gupta - Ayakar : Vidhan Avam Lekha, Sahitya Bhawan, Agra
5. Bare Act, Income Tax Act, Taxman Publication, Delhi

Paper VIII**BUSINESS STATISTICS**

- i. Introduction - Statistics as a Subject, Nature and Scope of Statistics, Importance of Statistics in Business, Limitations of Statistics, Basics of Data.
- ii. Measures of Central Tendency - Definition, Objectives and kinds of Statistical Averages- Arithmetic Mean, Median, Mode, Harmonic Mean, Geometric Mean.
- iii. Measures of Dispersion - Objectives of Measuring Dispersion, Range, Inter Quartile Range and its co-efficient, Quartile Deviation, Mean Deviation, Standard Deviation, Co-efficient of Variation
- iv. Skewness, Moments and Kurtosis - Measures of Skewness, Karl Pearson's and Bowley's Co-efficient of Skewness. Moments and Kurtosis.
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Suggested Readings :

1. Hooda, R.P. - Statistics for Business and Economics, Macmillan New Delhi
2. Lewin and Rubin - Statistics for Management, Prentice hall, New Delhi
3. Sanchiti and Kapoor - Statistics(Theory Methods and Application) Sultan Chand & Sons, New Delhi
4. Elhance, Elhance and Vaishya -Sankhiyaki Ke Sidhant, Kitab

Mahal Publication -

5. Singh, S.P - Sankhikiya Sidhant Avam Vyabhar, S. Chand & Co, Ltd., New Delhi.
6. Gupta B.N. - Sankhikiya Sidhant; SBPD, Agra

MARKETING GROUP

B.Com (Honours)

Paper V

ADVERTISING AND SALES PROMOTION ✓

- i. Introduction - Concept and Importance of Advertising, Types of Advertising, Advertising Process, Selling Advertising Objectives and Budget.
- ii. Advertising Media - Different Types of Media, Media Planning and Scheduling.
- iii. Impact of Advertising - Advertising Agency Roles, Relationship with clients Advertising Development, Measuring Advertising Effectiveness, Legal Aspect of Advertising, Designing of Messages.
- iv. Sales Promotion - Meaning, Nature and Functions, Types of Sales Promotion Schemes, Limitation of Sales Promotion.
- v. Sales Promotion Schemes - Sampling, Coupon, Exhibition and Displays, Trade Fair, Demonstration, Sales Promotion Techniques and Role of Sales people in making Promotional Measures Effective.

Suggested Reading :

1. Rorsiter John R, Percy larry - Advertising and Promotion Management, McGraw Hill, New Delhi.
2. Aaker, Batra & Myers - Advertising Management, Prentice Hall, New Delhi.
3. Coundiff and Govani - Sales Management, Prentice Hall, New Delhi.
4. Mishra M.N. - Sales Promotion & Advertising Mgt., HPH, Bombay
5. Chunawalla S.A. - Advertising, Sales and Promotion Management HPH, Bomaby.

Paper VI ✓

RURAL MARKETING

- i. Rural Marketing - Concept, Nature and scope, Importance, Rural vs Urban Marketing Environment, Emerging Rural Market after Globalisation.

- ii. Rural Consumer - Characteristics, Attitudes and Behaviour, Buying Patterns and influences, Segmenting Rural Markets.
- iii. Rural Marketing Strategies - Product Planning for Rural Markets, Quality and Size, Pricing Decisions, Packaging and Branding Decision.
- iv. Promotion and Distribution in Rural Markets - Media and Copy Decision, Distribution Channels and Logistics in Rural Markets.
- v. Input and Output Marketing - Agricultural Marketing System and Practices, Problems in Agricultural Marketing, Role of Government in Marketing of Agricultural Products, Cooperative Marketing Input Marketing.

Suggested Readings :

1. Gopal Swami T.P. - Rural Marketing, Wheelers Publication, New Delhi.
2. Nayyar and Ramaswami - Globalisation and Agricultural Marketing Rawat Publication, Jaipur.
3. Mamoriya C.B - Agricultural Marketing, Himalya Publishing House, New Delhi.
4. Kamat & Krishnamoorthy - A Text Book on Rural Marketing, HPH, Bombay
5. Singh L.P. - Agricultural Marketing Perspective and Issues, Arihant Publishers, Jaipur.
6. Singh L.P. - Regulated Market in India, Capital Publishing House, Delhi.
7. Singh L.P. - Cooperative Marketing in India and Abroad, HPH, Bombay.

Paper VII

SERVICES MARKETING

- i. Introduction - Importance of Service Sector, Nature and Types of Service, Difference between Service and Goods, Marketing Environment for Services Marketing, Indian Scenario.
- ii. Services Marketing Mix - Need for Expanded Marketing Mix, Product Mix, Promotion Mix, and Distribution Mix of Services, Additional three Ps Process, Physical Evidence and Attractions and management of Marketing people.
- iii. Marketing Segmentation and Selection, Service Market Segmen-

- tation, Targeting and Positioning.
- iv. Marketing of Profit making Service Organizations-Bank, Insurance, Hotel and Tourism.
 - v. Marketing of Non-Profit Service Organizations, Education, Health and Political Services.

Suggested Reading :

1. Jha S.M. - Services Marketing, HPH, Bombay
2. Joseph T.M. - Services Marketing, HPH, Bombay
3. Jha & Singh - Marketing Management, Indian Perspective, HPH, Bombay
4. Venugopal & Raghu - Services Marketing, HPH, Bombay
5. Shajhan S. - Services Marketing Concept, Application and Cases, HPH, Bombay
6. Balaji B. - Services Marketing and Management, S. Chand & Co. Ltd., New Delhi

Paper VIII

BUSINESS STATISTICS

- i. Introduction - Statistics as a Subject, Nature and Scope of Statistics, Importance of Statistics in Business, Limitations of Statistics, Basics of Data.
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2. Lewin and Rubin - Statistics for Management, Prentice hall, New Delhi
3. Sanchiti and Kapoor - Statistics (Theory Methods and Application) Sultan Chand & Sons, New Delhi
4. Elhance, Elhance and Vaishya - Sankhiyaki Ke Sidhant, Kitab Mahal Publication
5. Singh, S.P - Sankhikiya Sidhant Avam Vyabhar, S. Chand & Co, Ltd., New Delhi.
6. Gupta B.N. - Sankhikiya Sidhant; SBPD, Agra

INTERNATIONAL BUSINESS GROUP

B.Com (Honours)

Paper V

INTERNATIONAL FINANCE

- i. International Monetary System - History, Bretton Woods System and the period after 1971, IMF and World Bank.
- ii. Foreign Exchange Market - Exchange rate Determination and its Mechanism, Exchange Management.
- iii. International Banking - World Financial Market, Eurocurrency Markets.
- iv. Foreign Investments - Types and Motives, Foreign Investment in India, India's Investment in Foreign countries, Regulation of Foreign Investments in India.
- v. International Finance Management - Need and Importance.

Suggested Readings :

1. Burkley - Multinational Finance, Prentice Hall of India, New Delhi
2. Bhall V.K. - International Finance Management, Anmol Publication New Delhi.
3. Seth A.K. - International Finance, Galgotriya Publishing Company, New Delhi
4. Jain, P.K., Peyrard & Yadav - Foreign Exchange Market, Macmillan, New Delhi.
5. Agrawal, Singh & Gupta - Antarastriya Vypar Aur Vitta, Ramesh Book Depot.

Paper VI

INDIAN FOREIGN TRADE AND POLICY

- i. India's Foreign trade - Trends and Developments, Commodity

Compositions and Direction, India's Foreign Trade in Global Context.

- ii. Foreign Trade Policy and Control in India - Policy Making Body and Institutions.
- iii. Export Promotion Policies - Export Incentives duty exemption, Scheme, Role of Commercial banks in Foreign Trade, EXIM Bank.
- iv. Infrastructure for Export Promotion - Export Promotion Council, State Trading Organization, Export and Trading House, Export Processing Zone (EPZ)/ Special Economic Zone (SEZ).
- v. Foreign Investment Policy - Indian Joint Ventures Abroad, Multi-lateralism and Bilateralism in India's Foreign Trade.

Suggested Readings :

1. Verma M.L. - Foreign Trade Management in India, Vikash Publishing House, New Delhi.
2. Varshney R.L. - India's Foreign Trade, Kitab Mahal, Allahabad.
3. Mahaja V.S. - India's Foreign Trade and Balance of Payment, Deep and Deep Publication, New Delhi.
4. Avadhani V.A. - Global Business, HPH, Bombay
5. Mishra & Puri - Bhartiya Arthavyavastha, HPH, Bombay

Paper VII

INTERNATIONAL MANAGEMENT

- i. Introduction - Nature and Subject Matters of International Management, Growth Importance of International Management.
- ii. Cultural Context - Role of Culture Communicating across Cultures, Cross-cultural Negotiation and Decision Making.
- iii. Formulating Strategy - Strategy Formulation Process, Steps in Developing International Strategy.
- iv. Strategy Implementation and Control - Strategic Implementation, Organizational Structure of MNCs, Managing Effective Monitoring System.
- v. Human Resource Management - Staffing and training for International Operations, Motivating and Leading the people serving MNCs.

Suggested Readings :

1. Adhikari - Global Business Management, Macmillan, New Delhi
2. Subba Rao P. - International Business, HPH, Bombay
3. Deresky Helen - International Management, Prentice Hall of India

4. Adhikari V.A. - Global Business, HPH, Bombay
5. Stoner, Freeman, Gilbert - Management, Prentice Hall of India, New Delhi.

Paper VIII

BUSINESS STATISTICS

- i. Introduction - Statistics as a Subject, Nature and Scope of Statistics, Importance of Statistics in Business, Limitations of Statistics, Basics of Data.
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3. Sanchiti and Kapoor - Statistics(Theory Methods and Application) Sultan Chand & Sons, New Delhi
4. Elhance, Elhance and Vaishya -Sankhiyaki Ke Sidhant, Kitab Mahal Publication
5. Singh, S.P - Sankhikiya Sidhant Avam Vyabhar, S. Chand & Co, Ltd., New Delhi.
6. Gupta B.N. - Sankhikiya Sidhant; SBPD, Agra