

University of Rajasthan
Jaipur

SYLLABUS

B.Sc. PART-III

2015

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1. PHYSICS

Scheme: Min. Pass Marks : 36 Max. Marks : 100

Paper I	3 hrs. duration	Max. Marks : 33
Paper II	3 hrs. duration	Max. Marks : 33
Paper III	3 hrs. duration	Max. Marks : 34
Practical	5 hrs. duration	Max. Marks : 50
Practical Min. Marks	: 18	
Paper - I: Mathematical Physics and Special Theory of Relativity		


Duration : 3 Hrs. Maximum Marks 33

Note : 10 Questions are to be set taking two from each unit. Candidates have to answer five questions in all taking not more than one from each unit. The paper will have about 40 percent weightage (marks wise) on problems. Teaching : 2 hrs./week

UNTT-1

Orthogonal curvilinear coordinate system, scale factors, expression for gradient, divergence, curl and their application to cartesian, circular cylindrical and spherical polar coordinate.

Coordinate transformation and Jacobian, transformation of covariant, contravariant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors.


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Dirac delta function and its properties.

UNIT-2

Lorentz transformation and rotation in space-time, time like and space like vector, world line, macro-causality.

Four vector formulation, energy momentum four vector, relativistic equation of motion, invariance of rest mass, orthogonality of four force and four velocity, Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect.

UNIT-3

Transformation between laboratory and center of mass system, four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds; Pair production, inelastic collision of two particles, Compton effect.

Transformation of electric and magnetic fields between two inertial frames.

UNIT-4

The second order linear differential equation with variable coefficient and singular points, series solution method and its application to the Hermite's, Legendre's and Laguerre's differential equations; Basic properties (without proof) like orthogonality, recurrence relation, graphical representation and generating function of Hermite, Legendre, Laguerre and Associated Legendre function (simple applications).

UNIT-5

Techniques of separation of variables and its application to following boundary value problems (i) Laplace equation in three dimensional cartesian coordinate system - line charge between two earthed parallel plates, (ii) Helmholtz equation in circular cylindrical coordinates - cylindrical resonant cavity, (iii) Wave equation in spherical polar coordinates - the vibrations of a circular membrane, (iv) Diffusion equation in two dimensional cartesian coordinate system - heat conduction in a thin rectangular plate, (v) Laplace equation in spherical coordinate system - electric potential around a spherical surface.

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Syllabus : B.Sc. Part-III

Reference Books :

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

Paper-II: Elementary Quantum Mechanics and Spectroscopy
Duration : 3 Hrs. Maximum Marks 33

Note : 10 Questions are to be set taking two from each unit. Candidates have to answer five questions in all taking not more than one from each unit. The paper will have about 40 percent weightage (markswise) on problems. Teaching : 2 hrs./week

Unit-1

Development of quantum theory—Historical development and experimental evidence for quantum theory, black body radiation, Planck's radiation law, photoelectric Effect, Compton effect, Davission-Germer Experiment; Uncertainty principle, its application such as (i) Non-existence of electrons in nucleus, (ii) Ground State energy of H-atom, (iii) Ground state energy of harmonic oscillator, (iv) Natural width of spectral line; Schrodinger equation—Its need and justification, time dependent and time independent forms, physical significance of the wave function and its interpretation, probability current density; Wave packet, group and phase velocities, principle of superposition, diffraction at a single slit.

Unit-2

Operators in quantum mechanics, definition of an operator, linear and Hermitian operators; State functions, expectation value of dynamical variables-position, momentum and energy; Fundamental postulates of quantum mechanics; Eigen functions and eigen values, degeneracy; Orthogonality of eigen functions, commutation relations, Ehrenfest's theorem and complimentarity; Simple solutions of

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Schrodinger's equation : Time independent Schrodinger equation and stationary state solution, boundary and continuity conditions on the wave function, particle in one dimensional box, eigen function and eigen values, discrete energy levels, generalisation to three dimensions and degeneracy of levels.

Unit 3

Potential steps and rectangular potential barrier, calculation of reflection and transmission coefficients, qualitative discussion of application to alpha-decay; Square well potential problem, reflection and transmission coefficient, and resonant scattering; Bound state problems: Particle in one dimensional infinite potential well and finite potential well, energy eigen values and eigen functions, transcendental equation and its solution.

Unit 4

Simple harmonic oscillator (one dimensional case) Schrodinger equation and its solution, eigen function, energy eigen values, zero point energy; Parity-symmetric and anti-symmetric wave functions with graphical representation; Schrodinger equation for a spherically symmetric potential, rigid rotator, Schrodinger equation for a one-electron atom in spherical co-ordinates, separation of variables, orbital angular momentum and quantisation, spherical harmonics, energy levels of H-atom, shapes of $n=1$, and $n=2$ wave functions, average value of radius of H-atom, comparison with Bohr model and Bohr correspondence principle.

Unit 5

Quantum features of spectra of one electron atoms; Spectral results and the comparison with spectral energy values calculations with H-like atom; Examples of rotational and vibrational spectra and their qualitative comparison with rigid rotator and harmonic oscillator; Stern-Gerlach experiment and electron spin, spin and magnetic moment, spin orbit coupling and qualitative explanation of the fine structure; Atoms in a magnetic field, Zeeman effect.

Reference Books:

1. H.S. Mani, G.K. Mehta, Introduction to Modern Physics, East West Press Pvt. Ltd., New Delhi. (1988)

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Syllabus : B.Sc. Part-III

2. A.K. Ghatak and S.Lokanathan, Quantum Mechanics : Theory and Applications, Macmillan India Ltd., Delhi (1984), Third edition.
3. Richtmeyer, Kennard and Cooper, Mc Graw-Hill, 1969, sixth edition.
4. A. Beiser, Perspectives of Modern Physics
5. Parasmal Agrawal, Quantum Theory
6. S.S. Rawat and S.Singh, Elementary Quantum Mechanics and Spectroscopy (in Hindi)

Paper III: Nuclear & Solid State Physics

Duration : 3 Hrs.

Maximum Marks 33

Note : 10 Questions are to be set taking two from each unit. Candidates have to answer five questions in all taking not more than one from each unit. The paper will have about 40 percent weightage (markwise) on problems. Teaching : 2 hrs./week

Unit-1

Solid state structure and properties

Various types of binding; Cohesive energy and compressibility of ionic crystals; lattice, basis, lattice translation vector, Miller indices, simple crystal structures-SC, FCC, BCC and HCP (packing fraction, volume of unit cell). Thermal properties of solids : Normal modes spectrum of a lattice, spectral distribution function, concept of phonons, Debye model for the heat capacity of solids, contribution from electron gas in metals.

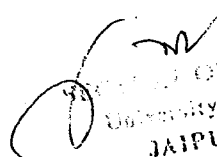
Unit-2

Electrical and magnetic properties

Equilibrium state of electron gas in a conductor in the absence of electric field, electron drift in an electric field, relaxation time and mean free path; Electrical conductivity of electron gas, Wiedemann-Franz-Lorentz law, temperature dependent electrical conductivity of metals, mobility and drift motion.

Origin of magnetism in materials, classical theory of diamagnetism and paramagnetism; Ferromagnetism, magnetic susceptibility and Curie law.

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Unit-3

Experimental techniques

X-ray diffraction-Laue equation, Debye Scherrer and Laue camera.; Importance of Rutherford scattering; Thomson and Bainbridge mass spectrometers and Hoffsdeter experiment for estimating charge and nuclear density distribution and radius; Principles of radiation detection, GM, BF₃, and scintillation counters; Particle accelerators- Cyclotron and Linac;

Unit-4

Nuclear structure and properties

Constituents of nucleus, properties of nuclear forces, binding energy, semi empirical mass formula, mass defect and packing fraction, saturation characteristics; Magnetic dipole moment and electric quadrupole moment, angular momentum and parity; Variation of size of nucleus with mass number; Stable nucleus and conditions for stability (e.g. beta emissions for different isobars).

Unit-5

Nuclear energy and particles

Liquid drop model and fission, fission and potential barrier, chain reaction, nuclear reactors (basic principle), nuclear fusion, Properties of particles, classification into leptons, mesons and baryons, matter and antimatter, conservation laws (Qualitative discussion) of isospin, strangeness, charge conjugation and parity, fundamental quark structure of particles.

Suggested references

1. Introduction to Nuclear Physics, W.E. Burcham
2. Introduction to Nuclear Physics, Wong
3. Modern Physics, HS Mani & G K Mehta
4. Nuclear Physics, R C Bhandari & D Somayajulu
5. Perspectives of Modern Physics, A Beiser
6. Solid state Physics by G.I Epifanov (Mir R Publisher,)
7. Introduction to solid state physics, C. Kittel (Weley Eastern Ltd.)

	Practicals	
Teaching	4 hrs/week	
Max. Marks	Duration	Min. Pass Marks
50	5 hrs.	18

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Syllabus : B.Sc. Part-III

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

Section-A

1. Determination of Planck's constant by photo cell (retarding potential method using optical filters, preferably five wave length).
2. Determination of Planck's constant using solar cell.
3. Determination of Stefan's constant (Black body method)
4. Study of the temperature dependence of resistance of a semiconductor (four probe method).
5. Study of Iodine spectrum with the help of grating and spectrometer and ordinary bulb-light.
6. Study of characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
7. Study of β -absorption in Al foil using GM Counter.
8. To find the magnetic susceptibility of a paramagnetic solution using Quinck's method. Also find the ionic molecular susceptibility of the ion and magnetic moment of the ion in terms of Bohr magneton.
9. Determination of coefficient of rigidity as a function of temperature using torsional oscillator (resonance method).
10. Study of polarization by reflection from a glass plate with the help of Nichol's prism and photo cell and verification of Brewster law and law of Malus.
11. e/m measurement by helical Method.
12. Measurement of magnetic field using ballistic galvanometers and search coil. Study of variation of magnetic field of an electromagnet with current.
13. Measurement of electric charge by Millikan's oil drop method.

Section-B

1. Study of a R-C transmission line at 50 Hz
2. Study of a L-C transmission line
 - (i) at fixed frequency.
 - (ii) at variable frequency.
3. Study of resonance in an LCR circuit (using air core inductance and damping by metal plate)

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- (i) at fixed frequency by varying C, and
- (ii) by varying frequency.
4. Study of the characteristics of junction diode & Zener diode.
5. Study of
 - (i) Recovery time of junction diode and point contact diode.
 - (ii) Recovery time as a function of frequency of operation and switching current.
6. To design Zener regulated power supply and study the regulation with various loads.
7. To study the characteristics of a field effect transistor (FET) and design/study amplifier of finite gain (10).
8. To study the frequency response of a transistor amplifier and obtain the input and output impedance of the amplifier.
9. To design and study of an R-C phase shift oscillator and measure output impedance (frequency response with change of component of R and C).
10. To study a voltage multiplier circuit to generate high voltage D.C. from A.C.
11. Using discrete components, study OR, AND, NOT logic gates, compare with TTL integrated circuits (I.C.'s).
12. Application of operational amplifier (OP-AMP) as : Minimum two of the following exercises—(a) Buffer (for accurate voltage measurement) (b) Inverting amplifier (c) Non inverting amplifier (d) Summing amplifier.

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2. Chemistry

Scheme :

Papers	Duration	Max. Marks	Min. Pass Mark
Paper I	3 Hrs.	33	
Paper II	3 hrs.	33	36
Paper III	3 hrs.	34	
Practical (One)	5 hrs.	50	18

Note : 10 questions are to be set taking two from each unit. The students will attempt 5 questions selecting one from each unit.


Paper-I: CH-301 : INORGANIC CHEMISTRY-I

(2 Hrs or 3 periods/week)

Unit-I

Hard and Soft Acids and Bases (HSAB)

Classification of acids and bases as hard and soft. Pearson's


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Syllabus : B.Sc. Part-III

HSAB concept, acid-base strength and hardness and softness. Sym-biosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Unit-II

Metal-ligand Bonding in Transition Metal complexes

Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal-field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

Magnetic Properties of Transition Metal Complexes

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-III

Electron Spectra of Transition Metal Complexes

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

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.

Unit-IV

Organometallic Chemistry

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metaethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Unit-V

Bioinorganic Chemistry

Essential and trace elements to Biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin.

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Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} . Nitrogen fixation.

Silicones and Phosphazenes

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

Paper-II: CH-302 : Organic Chemistry

(2 Hrs or 3 periods/week)

Unit-I

Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy.

Proton magnetic resonance ($^1\text{H-NMR}$) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1, 2 tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

Organometallic Compounds

Organometallic Compounds : the Grignard reagents-formation, structure and chemical-reactions.

Organozinc compounds : formation and chemical reactions.

Organolithium compounds : formation and chemical reactions.

Organosulphur Compounds

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphguanidine.

Unit-II

Heterocyclic Compounds

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

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Syllabus : B.Sc. Part-III

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

Unit-III

Organic Synthesis via Enolates

Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate; the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

Alkylation of 1,3-dithianes. Alkylation and acylation of enamines.

Carbohydrates

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)- glucose. Mechanism of mutarotation.

Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit-IV

Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination. end group analysis. selective hydrolysis of peptides. Classical peptide synthesis. solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

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Unit-V

Fats, Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value, soaps, synthetic detergents, alkyl and aryl sulphonates.

Synthetic Polymers

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol-formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes.

Natural and synthetic rubbers.

Synthetic Dyes

Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange. Congo red. Malachite green. Crystal violet. Phenolphthalein. Fluorescein. Alizarin and Indigo.

Paper-III: CH-303 : Physical Chemistry-III

(2 Hrs or 3 periods/week)

Unit-I

Elementary Quantum Mechanics

Black-body, radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect.

De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Unit-II

Molecular orbital theory, basic ideas-criteria for forming M.O.

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Syllabus : B.Sc. Part-III

from A.O., construction of M.O.'s by LCAO- H_2^+ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* , π , π^* orbitals and their characteristics. Hybrid orbitals- sp , sp^2 , sp^3 , calculation of coefficients of A.O's used in these hybrid orbitals.

Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models.

Unit-III

Spectroscopy

Introduction : Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum

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

Vibrational spectrum

Infrared spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank-Condon principle.

Qualitative description of σ , π and n M.O. their energy levels and the respective transitions.

Unit-IV

Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-

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Draper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

Physical Properties and Molecular Structure

Optical activity, polarization-(Clausius-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

Unit-V

Solutions, Dilute Solutions and Colligative Properties

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, elevation of boiling point and depression in freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Practical: CH-304 : Laboratory Course-III

(6 Hrs/Week)

Inorganic Chemistry

Synthesis and Analysis

- (a) Preparation of sodium trioxalato ferrate (III), $\text{Na}_3 [\text{Fe}(\text{C}_2\text{O}_4)_3]$ and determination of its composition by permanganometry.
- (b) Preparation of Ni-DMG complex, $[\text{Ni}(\text{DMG})_2]$
- (c) Preparation of copper tetraammine complex $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$.
- (d) Preparation of cis- and trans- bisoxalato diaqua chromates (III) ion.

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Syllabus : B.Sc. Part-III

Instrumentation

Calorimetry

(a) Job's (b) Mole-ratio method

Adulteration—Food stuffs

Effluent analysis water analysis

Solvent Extraction

Separation and estimation of Mg (II) and Fe (II)

Ion Exchange Method

Separation and estimation of Mg(II) and Zn(II)

ORGANIC CHEMISTRY

Laboratory Techniques

Steam Distillation

Naphthalene from its suspension in water

Clove oil from Clove

Separation of o-and p-nitrophenols

Column Chromatography

Separation of fluorescein and methylene blue

Separation of leaf pigments from spinach leaves

Resolution of racemic mixture of (\pm) mandelic acid

Qualitative Analysis

Analysis of an organic mixture containing two solid components using water, NaHCO_3 , for separation and preparation of suitable derivatives.

Synthesis of Organic Compounds

(a) Acetylation of salicylic acid, aniline, glucose and hydroquinone.

Benzoylation of aniline and phenol

(b) Aliphatic electrophilic substitution

Preparation of iodoform from ethanol and acetone

(c) Aromatic electrophilic substitution

Nitration

Preparation of m-dinitrobenzene

Preparation of p-nitroacetanilide

Halogenation

Preparation of p-bromoacetanilide

Preparation of 2,4,6-tribromophenol

(d) Diazotization/coupling

Preparation of methyl orange and methyl red

(e) Oxidation

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Preparation of benzoic acid from toluene

(f) Reduction

Preparation of aniline from nitrobenzene

Preparation of m-nitroaniline from m-dinitrobenzene.

Stereochemical Study of Organic Compounds via Models

R and S configuration of optical isomers.

E, Z configuration of geometrical isomers.

Conformational analysis of cyclohexanes and substituted cyclohexanes.

Physical Chemistry

Electrochemistry

- (a) To determine the strength of the given acid conductometrically using standard alkali solution.
- (b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
- (c) To study the saponification of ethyl acetate conductometrically.
- (d) To determine the ionisation constant of a weak acid conductometrically.
- (e) To titrate potentiometrically the given ferrous ammonium sulphate solution using $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{++}/\text{Fe}^{+++}$ system on the hydrogen scale.

Refractometry, Polarimetry

- (a) To verify law of refraction of mixtures e.g. of glycerol and water) using Abbe's refractometer.
- (b) To determine the specific rotation of a given optically active compound.

Molecular Weight Determination

- (a) Determination of molecular weight of a non-volatile solute by Rast method/Beckmann freezing point method.
- (b) Determination of the apparent degree of dissociation of an electrolyte (e.g., NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry

To verify Beer-Lambert law $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

B.Sc. Part III : Chemistry Practical (Pass Course)

Max. Marks:50

Duration of Exam:5 hrs Minimum marks:18

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Syllabus : B.Sc. Part-III

Inorganic Chemistry

Synthesis and Analysis of one of the four syntheses given in the syllabus.

OR

Separation and estimation of Mg (II) and Fe (II) by solvent extraction method.

OR

Separation and estimation of Mg (II) and Fe (II) by ion exchange method.

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Organic chemistry

(1) Synthesis of one of the six organic preparations. 8

(2) Analysis of an organic mixture containing two solid components using water, NaHCO₃, NaOH and preparation of suitable derivatives.

OR

Column chromatography techniques.

Perform one of the three column chromatography experiments. 10

Physical Chemistry

Perform one of the nine physical chemistry experiments given in the syllabus

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Viva-voce

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Record

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Books Suggested (Theory Course)

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. McDaniel 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 Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
8. Organic Chemistry, Morrison and Boyd, Prentice Hall.
9. Organic Chemistry, L.G. Wade Jr. Prentice Hall.
10. Fundamentals of Organic Chemistry, Solomons, John Wiley.
11. Organic Chemistry Vol. I, II, III S.M. Mukerji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International)

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12. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.
13. Introduction to Organic Chemistry. Streitwieser. Heathcock and Kosover. Macmillan.
14. Physical Chemistry, G.M. Barrow. International Student Edition, McGraw Hill.
15. Basic Programming with Application, V.K. Jain. Tata McGraw Hill.
16. Computers and Common Sense. R. Hunt and Shelly, Prentice Hall.
17. University General Chemistry, C.N.R. Rao, Macmillan.
18. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
20. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.

Books Suggested (Laboratory Courses)

1. Vogel's Qualitative inorganic Analysis, revised, Svehla, Orient Longman.
2. Vogel's Textbook of Quantitative Inorganic Analysis (revised), J. Bassett, R.C. Deneby, G.H. Jeffery and J. Mendham. ELBS.
3. Standard Methods of Chemical Analysis. W.W. Scott. The Technical Press.
4. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
5. Handbook of preparative Inorganic Chemistry. Vol I & II, Braver, Academic Press.
6. Inorganic Synthesis, McGraw Hill.
7. Experimental Organic Vol I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
8. Laboratory manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
9. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
10. Experiments in General Chemistry, C.N.R. Rao and U.C. Agarwal, East-West Press.
11. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill :
12. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.

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Syllabus : B.Sc. Part-III

13. Advanced Experimental Chemistry, Vol. I-Physical, J.N. Gurtu and R. Kapoor, S. Chand & Co.
14. Selected Experiments in Physical Chemistry, N.G. Mukerjee, J.N. Ghjose & Sons.
15. Experiments in Physical Chemistry, J.C. Ghosh, Bharati Bhavan.
(Instructions to examiners)

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3. ZOOLOGY

Scheme :

Min. Pass Marks – 36		Maximum Marks–100
Papers	Duration	Max. Marks
Paper-I	3 Hrs.	33
Paper-II	3 Hrs.	33
Paper-III	3 Hrs.	34
Practical	4 Hrs.	50

Note :

1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 (paper I & II)/10 (paper-III) very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Question should be evenly distributed covering entire syllabus.
Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q.No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any four questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

Paper-I

Z-301–Structure and Functions of Chordate Types

Section–A

Chordates

Protochordates and Cyclostomes :

1. Comparison of habit, external features and anatomy of *Herdmania* and *Branchiostoma* (excluding development).
2. Ascidian tadpole larva and its metamorphosis.

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3. Affinities of Hemichordata, Urochordata and Cephalochordata.
4. Habit, habitat and salient features of *Petromyzon* ; Ammocoete larva.

Section-B

Comparative Anatomy

1. Integument including structure and development of placoid scales, feathers and hair.
2. Basic plan of vertebrate endoskeleton.
3. Alimentary canal.
4. Heart and aortic arches.
5. Respiratory system.
6. Urinogenital system.
7. Brain

Section-C

Chordate Adaptations

1. Pisces : Scales and fins, migration, and parental care.
2. Amphibia : Parental care.
3. Reptilia : Poisonous and non-poisonous snakes, poison apparatus.
4. Aves : Flight adaptations, bird migration.
5. Mammals : Adaptive radiation, dentition.

Paper-II

Z-302-Ecology and Environmental Biology

Note :

1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 (paper I & II)/10 (paper-III) very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Question should be evenly distributed covering entire syllabus.
Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q.No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any four questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

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Section—A
Ecology

1. Basic concepts in ecology, its meaning and history.
2. Concepts of limiting factors.
3. Ecosystem : Biotic and abiotic factors.
4. Ecosystem : Production, consumption and decomposition in an ecosystem ; concepts of food-chain, food-web, trophic structure, ecological pyramids.
5. Biogeochemical cycles of O₂, CO₂, H₂O, N, P, and role of microbes.
6. Ecosystem : Its homeostasis, functional aspects, productivity concepts and its determination, ecotone, edge effects, niche.
7. Population Ecology : Density and methods of its measurement, natality, mortality, age ratio and distribution, pyramids, fluctuations, biotic potential, dispersal, growth forms, population interactions and propagation, brief idea of demography.
8. Community Ecology : Characteristics of natural communities, structure, composition, stratification.
9. Ecological Succession : Types and patterns, concept of climax, details of xerosere and hydrosere successions.
10. Habitat Ecology : Brief account of fresh water, marine, terrestrial and estuarine water ecosystems.
11. Major biomes of the world.
12. Ecology and Human Future : Growth rate, role of human kind in modifying natural communities in term of public health and welfare with respect to use of pesticides, conservation and pollution.

Section—B

Environmental Biology—I

1. Environment and its Concepts, global environment, hydrosphere, lithosphere and atmosphere.
2. Natural Resources : Present status and future needs.
3. Conservation and Management of Natural Resources : Renewable (Forest, wildlife, water) and non-renewable (soil, minerals and energy).
4. Environmental Pollution I : General outline and various types of pollution of water, air and soil.
5. Environmental Pollution II : Sources and remedies for noise, radiation, industrial chemicals, agrochemicals insecticides.

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- pesticides and household pollutants.
6. Green House Effect, Ozone layer depletion, El- Nino and La-Nino effects.
 7. Radiation and Environment : Types of radiation, fallout, effects of radiation, nuclear accidents.
 8. Basic concepts of bioaccumulation, biomagnifications, biodegradation of pollutants.

Section-C

Environmental Biology-II

1. Wildlife Conservation : Vanishing and threatened animals and plants with special reference to Rajasthan, wildlife management efforts by Government and non-Government organizations.
2. Impact of Urbanization : Development and distribution of urban centers, factors, problems and the solutions of urbanization, brief idea of human population with special reference to India and Rajasthan.
3. Space Ecology : Space ecosystem, space problems and their solutions, colonization.

Paper-III

Z-303—Applied Zoology, Ethology and Biostatistics

Note :

1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 (paper I & II)/10 (paper-III) very short answer (maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Question should be evenly distributed covering entire syllabus.
Second part of the question paper will be of long answer type questions having three sections. There will be total 9 questions (Q.No. 2 to 10) in this part i.e. three from each unit/section, out of which candidate will be required to attempt any four questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

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Syllabus : B.Sc. Part-I/1

Section-A
Applied Zoology

Principles and Practices of the following :

1. Vermiculture
2. Sericulture (Including Ericulture)
3. Lac culture
4. Apiculture
5. Prawn culture
6. Poultry keeping
7. Pisciculture

Economic Importance of the following :

1. Protozoa
2. Corals and coral reefs
3. Helminthes
4. Arthropods :
 - i. Crustacean larvae.
 - ii. Insects and their management.
5. Mollusca : Including an outline idea of Pearl culture.

Section-B
Ethology

1. Introduction and history of Ethology.
2. Concepts of Ethology : Fixed action pattern, sign stimulus, innate releasing mechanism, action specific energy, motivation, imprinting and learning.
3. Methods of studying brain behaviour : Neuroanatomical, neurophysiological and neurochemical techniques.
4. Elementary idea of role of pheromones.
5. Societies : Characteristics and advantages with special reference to honey-bee, deer and monkey.

Section-C
Biostatistics

1. Introduction scope and application of Biostatistics.
2. Understanding the concepts of descriptive and inferential statistics.
3. Frequency distribution.
4. Graphical and tabular presentation of data.
5. Mean, mode, median and their significance.
6. Standard deviation, standard error and their significance.

PRACTICAL-ZOOLOGY

Min. Marks : 18

4 Hrs. duration

Max. Marks : 50

I. Anatomy :

1. a. General viscera, afferent and efferent branchial blood

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vessels, eye muscles, and their innervation, brain, cranial nerves, and internal ear of Scoliodon.

- b. Blood vascular, urinogential and nervous system (brain, cranial nerves, optical nerves) of rat or any suitable animal, if available. In this exercise CAL (computer assisted learning) may be used with a software Compurat.
2. **Permanent preparations and study of the following :** Spicules and pharyngeal wall of Herdmania; placoid scales and ampulla of Lorenzini of Scoliodon; Striped muscle fibers and blood film of any vertebrate.
3. **Osteology :** A comparative study of articulated and disarticulated bones of any amphibian, reptile, bird and mammal.
4. **Study of microscopic slides :** Whole mounts of oral hood, vellum and pharyngeal wall of Amphioxus; T.S. of Amphioxus through various regions; tadpole larva of Ascidia; whole mounts of Pyrosoma, Salpa, Doliolum and Oikopleura; V.S. of skin of fish, T.S. body of fish through various regions, V.S. skin of bird; V.S. mammalian skin; T.S. mammalian liver; kidney, stomach, intestine, bone, spinal cord, lung, duodenum, pancreas, testis and ovary.
5. **Study of Museum Specimens :** Ascidia; Ciona; Botryllus; Ammocoete larvae; Petromyzon; Myxine or Bdellostoma; Zygaena (Sphyrna); Torpedo; Chimaera; Acipenser; Amia or Lepidosteus; Labeo; Clarias; Anguilla; Hippocampus, Exocoetus; Echeneis, any flat-fish; Protopterus, Ichthyophis or any blind-worm, Proteus; Ambystoma; Axolotal, Siren; Alytes; Hyla, Testudo; Chelone; and Fresh Water Tortoise; Sphenodon; Hemidactylus; Phrynosoma; Draco; Chameleon; Eryx; Hydrophis; Naja; Viper; Bungarus; Crocodilus; Alligator; Archaeoptery; Running bird, Pavo cristatus (Peacock); Choriotis (Great Indian Bustard); Ornithorhynchus, Tachyglossus, Didelphys, Macropus Bat; Loris; Scaly Ant-eater.

II. Environmental Biology :
Analysis of Environment :

1. Soil pH

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Syllabus : B.Sc. Part-III

2. Water analysis, pH, alkalinity, acidity, dissolved O₂ and free CO₂.
3. Salinity (Chloride).
4. Qualitative estimation of zoo-plankton in given sample of water.

III. Ethology :

1. Study of any stored insect pest.
2. Antennal grooming in cockroach.
3. A visit to a zoo, museum of natural history and wild life sanctuary. (where present).

IV. Biostatistics:

1. Construction of frequency table, histograms, polygons, pie-charts.
2. Exercises on mean, mode and median.

Scheme of Practical Examination and Distribution of Marks :

Time : 4 Hrs.

	Min. Pass Marks: 18 Regular	Max. Marks: 50 Ex-student
1. Dissection (any system)	8	9
2. Permanent preparation	4	6
3. Environmental Biology	6	7
4. Exercise in Ethology	2	3
5. Biostatistics	4	4
6. Identification and comments on spots (1 to 18)	16	16
7. Viva-voce	5	5
8. Class Record	<u>5</u>	—
Total :	50	50

Note :

1. With reference to dissection, the candidates must be well versed with the techniques of flag-labeling and black paper insertion, as the case may be for a clear illustration.
2. With reference to whole mounts and museum specimens in case of unavailability, the animal types should be substituted with diagrams, photographs, models etc.
3. Candidates will keep a record of all work-done in the practical

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4. Exercise in Ethology may also be based on the behavioural aspect of the given animal (without revealing its identity).
5. Emphasis should also be given on writing part, allocating separate marks.

It should be ensured that animals used in the practical exercises are not covered under the wildlife protection act 1972 and amendments made subsequently.

Recommended Books :

1. Bailey : Biostatistics.
2. Bhatia, A.L. Kohli, K.S. and Swarup, M. : Prani Paristhitic Paryavaran jaiviki avem Prani Vitran. Ramesh Book Depot, Jaipur.
3. Various dimensions of Environmental Biology, Indus Valley Publication, Jaipur.
4. Goon, A.M.K. and Gupta, B.D., Fundamental of Statistics.
5. Gupta P.K. : Environmental Biology, Rastogi Publications, Meerut.
6. Gupta, S.P., Biostatistics.
7. Health, and Downie, Basic Statistical Methods.
8. Hinde, R.A. : Animal Behaviour, McGraw Hill Co., New York.
9. Hyman, L.H. : Comparative Vertebrate Anatomy, University of Chicago Press, Chicago.
10. Jacob, D. and S.C. : Paricayak Jantu Vayvaharil. Ramesh Book Depot, Jaipur.
11. Jacob, D., and Vyas, D.K. : Chordate Prayogic Prani Shastra, Ramesh Book Depot, Jaipur.
12. Jacob, D., and Vyas, D.K.: Laboratory manual in Chordate and experimental Zoology, Ramesh Book Depot, Jaipur.
13. Jacob, D., Sharma, A and Nandchahal, K., : Choradata, Sanrachana avem Udvikas, Ramesh Book Depot., Jaipur.
14. Jacob, D., Sharma, A. and Nandchahal, K. : Chordata, Anatomy and Evolution, Rajesh Book Depot., Jaipur.
15. Manning, A. : An Introduction to Behaviour, Edward Arnold, London.
16. Mathur, R. : Animal behaviour, Rastogi Publications, Meerut.
17. Odum, E.P. : Fundamental of Ecology, W.B. Saunders, New Delhi.
18. Romer, A.S. : The Vertebrate Body, Vakil, Bombay.
19. Saharia, V.B. : Wildlife in India, Natraj Publishers, Dehradun.

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Syllabus : B.Sc. Part-III

20. Spiegel M.R. : Statistics.
21. Verma P.S. and Agrawal U.K. : Environmental Biology, S. Chand and Co., New Delhi.
22. Wallace, R.A. : Animal Behaviour, Goodyear Publishing Co., 18, Grazimek Encyclopedia of Ethology.
23. Young, J.Z. : The Life of Vertebrates, Oxford University Press, Oxford.

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4. Botany

B.Sc. Part III

Max. Marks : 100		Min Pass Park : 36
Paper-I	3 hrs.	Max. Marks : 33
Paper-II	3 hrs.	Max. Marks : 33
Paper-III	3 hrs.	Max. Marks : 34
Practical	5 hrs.	Max. Marks. : 50

Note :

1. There will be 5 Questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer copy only.
2. Q.No. 1 (Objective/short answer type) will have 20 questions covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

B.Sc. Part-III Max. Marks : 33

Paper-I Taxonomy and Embryology of Angiosperm
(2 hrs or 3 periods/week)

Unit-I

Introduction, Principles of Taxonomy. Units of Classification. Concept of Genus and Species. Binomial Nomenclature, International Code of Botanical Nomenclature.

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Taxonomic Literature; Botanical Gardens and Herbaria.

Development of Taxonomy and History of Different System of Classification. Bentham and Hooker's System of Classification. Engler and Prantle System of Classification.

Evolutionary Trends in Angiosperms. Primitive and Advanced Characters.

Diversity of flowering plants as illustrated by members of the families and economic importance of the following families: Ranunculaceae, Fabaceae, Apiaceae.

Unit-II

Diversity of flowering plants as illustrated by members of the families and economic importance of the following families: Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Euphorbiaceae and Poaceae.

Unit-III

Ontogeny of the flower parts-development and variations. Structure of anther, microsporogenesis, Tapetum-types and function, development of male gametophyte, structure of pollen grains.

Types of ovule, Megasporogenesis, development of female gametophyte (Embryosac). Pollination, Pollination types. Fertilization, double fertilization, significance of double fertilization.

Unit-IV

Development of Dicot and monocot embryo Formation of embryo Types of embryo. Endosperm, Types of

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Syllabus : B.Sc. Part-III

endosperm, Endosperm haustoria. Polyembryony, Induced polyembryony. Parthenocarpy, Apomixis and adventive embryony.

Suggested Laboratory Exercises.

(A) Taxonomy:

(I) The following genera are suitable for study of families:

1. Ranunculaceae-*Ranunculus*, *Delphinium*.
2. Fabaceae-*Pisum sativum*, *Cassia* and *Acacia*.
3. Apiaceae-*Coriandrum*.
4. Convolvulaceae-*Ipomea*, *Jacquimontia*.
5. Apocynaceae-*Catharanthus*, *Thevetia*
6. - Asclepiadaceae-*Calotropis*.
7. Lamiaceae-*Ocimum*, *Salvia*.
8. Euphorbiaceae-*Euphorbia pulcherrima*, *Ricinus*.
9. Acanthaceae-*Adhatoda*.
10. Asteraceae-*Helianthus*, *Tridax*
11. Rubiaceae-*Hamelia*
12. Poaceae-*Triticum*

(II) Types of Inflorescence and Fruits:

(III) Embryology

- 1.. T.S. of anther, to study the wall layers and pollen sac with pollen grains.

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2. Study the various types of ovules, draw the diagrams.
3. Study the various types of placentations.
4. Study the germination of pollen grain *in situ* and observe the path of pollen tube.
5. Study of various stages of embryo (*Raphanus* fruit)

Suggested Readings:

1. Taxonomy of Angiosperms-V.N. Nair (1995) TMH Publishing Company Limited, New Delhi.
2. Introduction to the Principles of Plant Taxonomy V.V. Sivarajan (1984) Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Plant Taxonomy-Sushella M.Das (2003) Dominant Publishers and Distributors, New Delhi.
4. Plant systematics. Gurcharan Singh (2001) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Trivedi, P.C. : N. Sharma and J.L. Sharma (2003) Structure, Development and Reproduction in Flowering Plants. Ramesh Book Depot, Jaipur
6. Bhojwani, S.S. and Bhatnagar, S.P. (2000) The embryology of Angiosperms 4th Edition Vikas Publishing House, New Delhi.
7. An Introduction to the Embryology of Angiosperm. Maheshwari, P.(1950) New Delhi.
8. Recent Advances in the Embryology of Angiosperms. Ed. Maheshwari, P.(1963) New Delhi.

PAPER-II : Molecular Biology and Biotechnology
(2 hrs or 3 period/week) Max. Marks : 33

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Syllabus : B.Sc. Part-III

Unit-I

History of molecular biology : Watson and Crick model of DNA , Chromatin structure and gene expression, gene concept. Polymerase chain reaction, Application of PCR technique, DNA fingerprinting and its use. Preliminary account of DNA synthesis and repair.

Unit-II

Central dogma, Reverse transcriptase and its application, Transcription in eukaryotes, RNA processing, capping, splicing and polyadenylation, Translation, initiation, elongation and termination. Jacob-Monod and Lac operon, Negative and positive control, attenuation and antitermination, structure of promoter gene.

Unit-III

Biotechnology : Functional definition. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency. Differentiation and morphogenesis. Micropropagation and synthetic seeds. Protoplast culture and somatic hybridization. Anther culture and androgenic haploid. Embryo culture and application.

Unit-IV

Recombinant DNA technology : techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer, Plasmids and cosmids, cDNA library, gene amplification. Application of Biotechnology and Transgenic plants.

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Suggested Books :

1. Cell and Molecular Biology. PK Gupta.
2. Molecular Biology of the Gene. JD Watson et al.
3. Plant Cell tissue and organ culture. OL Gamborg and GC Philips.

Practical Exercises:

Aseptic culture technique

Media preparation

Explant culture-shoot tip nodal segment

Callus culture

Protoplast isolation

Elementary knowledge of principles and uses of various instruments in molecular biology and biotechnology-Laminar airflow, Centrifuge, Autoclave, Incubator, Spectrophotometer, PH meter, Gel electrophoresis unit.

B.Sc. Part-III Max. Marks : 34

Paper-III Plant Ecology & Economic Botany .

(2 hrs or 3 period/week)

Unit-I

Plants and Environment : Atmosphere (gaseous composition and properties of four distinct zone viz. stratosphere, troposphere, mesosphere and thermosphere) : water (distribution in biosphere and properties. of water cycle) : Morphological, anatomical and physiological responses of plants to water (Hydrophytes and Xerophytes). Light (global radiation, photosynthetically active radiation. Zonation in water body : littoral, limnetic and profundal zones; photoperiodism, heliophytes and sciophytes) Temperature (Raunkier's classification of plants: megatherm, mesotherm, microtherm, helkistotherm; themoperiodicity and

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Syllabus : B.Sc. Part-III

vernalisation). Soil (soil profile, development-weathering and maturation). Soil texture, soil types, role of PH, organic matter, soil water, soil nutrients. Interactions among organisms (neutralism, amensalism, allelopathy), competition, predation, parasitism, protocooperation, mutualism. Environmental protection act.

Unit-II

Population, Community, Ecosystem and Phytogeography : Population ecotypes, ecaedes. Community characteristics : stratification, life forms and biological spectrum, frequency density and cover. Ecological succession: types (primary and secondary) mechanism nudation, migration, ecesis, reaction and climax; xerosere, hydrosere; Ecosystems: Structure-abiotic and biotic components, trophic level, food chain, food web, ecological pyramids, energy flow (Box and Pipe model of Odum). Biogeochemical cycles of carbon, and phosphorus; Vegetation types of Rajasthan Endangered plants of Rajasthan.

Unit-III

Basic concept of center of origin of cultivated plants. Food plants-rice, wheat, maize, potato, sugarcane. Vegetables : General account with a note on radish, onion, garlic, cabbage, spinach, cauliflower, cucumber, tomato, lady finger and pea. Fruits: General account with a note on apple, banana, ber, mango mulberry, jamun, watermelon, muskmelon, guava and orange. Vegetable oil : groundnut, mustard and coconut.

Unit-IV

Spices : General account with an emphasis on those cultivated in Rajasthan (Cumin, Capsicum, Coriander).

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Beverages : Tea and coffee. Medicinal plants: General accounts with an emphasis on plant species cultivated in Rajasthan (Senna, Isabgol, Safed musli). Fibers: Cotton and jute. Wood : General account of sources of firewood, timber and bamboos; Rubber. Ethnobotany : a general account.

Practical Exercises:

1. Study frequency and density of plant species of campus vegetation by quadrat method.
2. Variation in soil moisture in relation to depth.
3. To estimate bulk density of grassland and woodland soil.
4. To estimate the porosity of grassland and woodland soil sample.
5. To determine moisture content of grassland and woodland soil.
6. To measure dissolved oxygen content in polluted and unpolluted water samples.
7. To measure temperature of different water bodies.
8. Water holding capacity of the soil.
9. Find out pH of soil sample by Universal Indicator method.
10. Find out pH of water sample by pH meter.
11. Find out transparency of a waterbody by Sechhidisk.
12. Study morphology (external and internal) of hydrophytes (*Hydrilla* stem, *Typha* leaf and *Nymphaea/Eichhornia* petiole) and xerophytes (*Calotropis*, *Capparis* and *Casuarina* stem, *Nerium* leaf) with special reference to their adaptations.
13. Study following specimen with special reference to:
 1. botany of the economically important part.
 2. Processing, if any involved.

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Syllabus : B.Sc. Part-III

3. Specimen of cereals, pulses, spices beverage (tea & coffee beans) sugar. oil seeds (mustard, groundnut).
14. Study of starch grain in potato and pea.
Histochemical test : Cellulose, lignin, starch, fat, protein and tannin.
15. Submit 5 specimen of locally important medicinal plants.

Botany Practical Examination B.Sc. Pt. III

Scheme of examination

Time : 5 Hours

Max. Marks: 50

Regular Ex-student

Q1. Plant Taxonomy

Describe vegetative and reproductive 10 09
parts of flower in semi-technical language.
Give floral diagram and floral formula and
identify the family giving reasons.

Q2. Comment on the embryological 05 08
exercise/Comment on the Tissue
culture or Biotechnology technique

Q3. Plant Ecology

(A) Ecological anatomy 05 07
(B) Ecological exercise 05 05

Q4. Economic Botany

(A) Histochemical test 05 06
(B) Comment on the botany and morphology
of economic part of specimen

Q4. Spotting (1-5 spots) 10 10

Q5. Record 05 -

Q6. Viva-voce examination 05 05

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5. Geology

Scheme : Min. Pass Marks : 36 Max. Marks : 100
Paper-I : Stratigraphy and geology of India : Marks : 50
Paper-II : Economic Geology & Mineral Economics : Marks : 50

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Practical

Marks : 50

PAPER-I : Stratigraphy and Geology of India

Section-A

Stratigraphy and its relation with other branches, aims and principles of stratigraphy, environment of deposition facies, Lithology, Homotaxis and contemporaneity.

Standard stratigraphical scale.

Imperfection in geological records, principles of correlation.

Palaeogeography of India in Permo-carboniferous period, Physiographic subdivisions of India.

Stratigraphical divisions in India and their equivalents.

Section-B

Stratigraphy, distribution, lithology, structure, correlation and Mineral riches of the following: Archaeans, Cuddapahs and the Vindhya with special reference to Rajasthan.

Distribution, succession, climate, sedimentation, correlation, fossil content and mineral resources of the Gondwana Supergroup.

Section-C

Triassic Period : Triassic of Spiti—lithology, succession and fossil content.

Jurassic Period : Jurassic of Kachchh, Western Rajasthan—Bagh Beds and Lameta Ghat Series—lithology, succession and fossil content.

Deccan traps—origin, composition, distribution and age; Intertrappean beds—succession, lithology fossils content and distribution.

Tertiary Period : Subdivisions, lithology, distribution, succession, and fossils.

Siwalik Supergroup—distribution, lithology, depositional environment and fossils; typical vertebrate fossils.

Pleistocene of Assam. Peninsular India and Kashmir Pleistocene and Recent glaciation.

Tectonic frame work of India.

Practical

Neat drawing of the standard stratigraphical scale, showing against each division or division of the typical lithographic units, the type fossils, the faunal assemblages, their population and ranges etc.

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Syllabus : B.Sc. Part-III

Neat drawings of the paleogeographical maps of India during Permo- Carboniferous period. Plotting of various geological formation in outline map of India.

Neat drawing of the structural and tectonic map of India.

Identification and description of the following rocks; Banded Hematite, Quartzite, Khondalite, Charnockite, Gondite, Vindhyan Sandstone, Products Limestone, Barakar Sandstone, Golden Oolite, Dhosa Oolite, Nummulitic Limestone, Fenestella Shale, Gondwana Shales with plant impressions.

PAPER-II : Economic Geology and Mineral Economics

Note : The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section-A

Economic Geology and its relationship with various branches of Geology, Magma and its relationship with mineral deposits, Ore and gangue minerals. Historical development of Economic Geology, Processes, of Mineral formation : Magmatic, Hydrothermal, Contact metasomatic, Evaporation, Oxidation and supergene enrichment, Sedimentation, Mechanical concentration, Residual concentration and Metamorphism.

Section-B

Classification of mineral deposits : outlines of Lindgren's and Bateman's classification, Important ores, Composition physical properties, mode of occurrence, association, origin, distribution in India & uses of the following metals, gold, silver, copper, lead iron, manganese, chromium and aluminum. Examples from Indian stratigraphic record. Environmental implications of exploitation of mineral resources.

Section-C

Important industrial minerals : Model of occurrence, physical properties, chemical composition and distribution in India—Refractory, Abrasives, Ceramics, Cement, Gemstones, Glass, Paint, and Fertilizers.

Coal, petroleum and radioactive minerals : their occurrences, distribution and origin-oil traps.

Building stones : characters, distribution and mode of occurrence.

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Mineral wealth of Rajasthan.

Strategic, Critical & essential minerals; National Mineral policy; Conservation and substitution.

Mineral concession rules; marine mineral resources; and Law of Sea.

Practical

Drawing of neat diagram depicting the following :

- (a) Gossan Oxidation zone and supergene enrichment zone.
- (b) Structural traps for oil accumulations.
- (c) Stratigraphical trap for oil accumulation.

Systematic study, identification, description, mode of occurrences and uses of the following minerals -

Haematite, magnetite, limonite, siderite, pyrites, pyrrhotite, pyrolusite, psilomelane, chromite, ilmenite, wolframite, chalcophyrite, Cuprite, malachite, azurite, galena, sphalerite, cassiterite. Magnesite, bauxite, beryl, realgar, orpiment, stibnite, molybdenite, cinabar, barite, Pitchblende, asbestos, muscovite, graphite, sillimanite, Kyanite, zircon, clays, garnet, corundum, gypsum, talc, apatite, rock phosphate, calcite, coal and its varieties.

In an outline map of India plotting of occurrence of the following minerals :

Copper ore, Pb-Zn Ag ore, Chrome ore, Manganese ore, Aluminum ore, Atomic minerals, rock-phosphate, Mica, diamond, Iron, ore, coal, Gold :

Distribution of important minerals in the outline map in Rajasthan. Plane table and chain survey.

Field training : Field work for at least 10 days duration at the places of geological interest pertaining to the theory papers in the states of Rajasthan/Gujarat/Madhya Pradesh and report thereon along with the submission of field specimens.

Book Recommended :

1. Batman, A.M. : Introduction to economic mineral deposits.
2. Wadia, M.D. : Minerals of India, Book Trust of Publ.
3. Rao, T.C. and Gokhle, K.V.G.K. : Ore deposits of India, their distribution and processing.
4. Krishna Swamy, S. : India's Economic Oxford & I.B.H. Publishing Co., New Delhi.

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Syllabus : B.Sc. Part-III

6. MATHEMATICS
B.A./B.Sc. Part-III-2010

Teaching : 3 Hours per Week per Theory Paper.

Examination :

	Min. Pass Marks	Max. Marks
Scheme : Science	54	150
Arts	72	200
	Duration	Max. Marks
Paper-I Algebra	3 hrs	50 (Science) 66 (Arts)
Paper-II Complex Analysis	3 hrs.	50 (Science) 66 (Arts)
Paper-III Dynamics and Computer Theory	2½hrs.	32 (Science) 44 (Arts)
Programming in C	Practical 2 hrs.	18 (Science) 24 (Arts)

Notes :

1. Papers I and II are divided into Five Units. Two questions will be set from each Unit. Candidates are required to attempt Five questions in all taking One question from each Unit. All questions carry equal marks.
2. Paper III is divided in Four Units. Two questions will be set from each Unit. Candidates are required to attempt Four questions in all taking One question from each Unit. All questions carry equal marks.
3. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.
4. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.
5. An Internal/external examiner can conduct Practical Examination.

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tion of not more than 100 (Hundred) Candidates (20 Candidates in one batch).

6. Each candidate has to pass in Theory and Practical examinations separately.

Paper-I Algebra

Teaching : 3 Hours per Week

**Duration of Examination : 3 Hours Max.Marks: 50(Science)
66 (Arts)**

Note : This paper is divided into Five Units. Two questions will be set from each Unit. Candidates are required to attempt Five questions in all taking One Question from each Unit. All questions carry equal marks.

Unit 1: Definition and simple properties of Groups and Subgroups.

Permutation group, Cyclic group. Cosets, Lagrange's theorem on the order of subgroups of a finite order group.

Unit 2: Morphism of groups, Cayley's theorem. Normal subgroups and Quotient groups. Fundamental theorems of Isomorphism.

Unit 3: Definition and simple properties of Rings and Subrings. Morphism of rings. Embedding of a ring, Integral domain and field. Characteristics of a Ring and Field.

Unit 4: Ideals and Quotient Ring. Maximal ideal and Prime ideal. Principal Ideal domain. Field of quotients of an integral domain. Prime fields. Definition, Examples and Simple properties of Vector spaces and Subspaces.

Unit 5: Linear combination, Linear dependence and Linear independence of vectors. Basis and Dimension. Generation of subspaces. Sum of subspaces. Direct sum and Complement of subspaces. Quotient space and its dimension.

Paper-II Complex Analysis

Teaching : 3 Hours per Week

**Duration of Examination : 3 Hours Max.Marks: 50(Science)
66 (Arts)**

Note : This paper is divided into Five Units. Two questions will be set from each Unit. Candidates are required to attempt Five questions in all taking One question from each Unit. All questions carry equal marks.

Unit 1: Complex plane. Connected and Compact sets. Curves and

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Syllabus : B.Sc. Part-III

Regions in complex plane. Jordan curve Theorem (statement only). Extended complex plane. Stereographic projection. Complex valued function—Limits, Continuity and Differentiability. Analytic functions, Cauchy-Riemann equations (Cartesian and polar form). Harmonic functions, Construction of an analytic function.

Unit 2: Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions. Cauchy integral formula, Analyticity of the derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville' theorem.

Unit 3: Taylor's theorem. Laurent's theorem. Maximum modulus theorem. Power series—Absolute convergence, Abel's theorem, Cauchy-Hadamard theorem. Circle and Radius of convergence, Analyticity of the sum function of a power series.

Unit 4: Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Riemann's theorem, Casorati-Weierstrass theorem.

Residue at a singularity, Cauchy's residue theorem. Argument principle. Rouché's theorem. Fundamental theorem of Algebra.

Unit 5: Conformal mapping. Bilinear transformation and its properties.

Elementary mappings: $w(z) = \frac{1}{2} \left(z + \frac{1}{z} \right)$, z^2 , e^z , $\sin z$, $\cos z$, and $\log z$.

Evaluation of a real definite integral by contour integration. Analytic continuation. Power series method of analytic continuation.

Paper-III Dynamics and Computer Programming in C

Teaching : 3 Hours per Week

**Duration of Examination: 2½ Hours Max.Marks: 32(Science)
44 (Arts)**

Note : This paper is divided into Four Units. Two questions will be set from each Unit. Candidates are required to attempt Four questions in all taking One question from each Unit. All questions carry equal marks.

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Unit 1: Velocity and acceleration—along radial and transverse directions, along tangential and normal directions. S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.

Unit 2: Motion in resisting medium—Resistance varies as velocity and square of velocity. Work and Energy. Motion on a smooth curve in a vertical plane. Motion on the inside and outside of a smooth vertical circle.

Unit 3: Central orbits-p-r equations, Apses, Time in an orbit, Kepler's laws of planetary motion. Moment of inertia—M.I. of rods, Circular rings, Circular disks, Solid and Hollow spheres, Rectangular lamina, Ellipse and Triangle. Theorem of parallel axis. Product of inertia.

Unit 4: Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C—Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, Implementing loops in Programs, Defining and manipulation arrays and functions.

Practical:

**Teaching : 2 Hours per Week per Batch
(20 Candidates in each Batch)**

Duration : 2 Hours

Scheme :	Science	Arts
Max. Marks	18	24
Min. Pass Marks	07	09
Distribution of Marks		
Two Practicals of		
6 Marks each	= 12 Marks (08 Marks each)	16
Practical Record	= 03 Marks	04
Viva-voce	= 03 Marks	04
Total	= 18 Marks	24

The paper will contain Two practicals. The candidates are required to attempt both practicals.

Programming in C and execution for the result of

1. Solution of linear algebraic equations by Gauss elimination method
2. Solution of algebraic and transcendental equations by Bisection, False position and Newton-Raphson Methods.

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Syllabus : B.Sc. Part-III

3. Solution of ordinary differential equations by Euler's and Runge-Kutta 4th order method
4. Numerical integration by Trapezoidal and Simpson's one third rule.

Note :

1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
2. Each Candidate has to pass in Practical and Theory examinations separately.

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7. GEOGRAPHY

Scheme :

Papers	Duration	Max. Marks	
		Arts	Science
Paper-I	3 hrs.	75	50
Paper-II	3 hrs.	75	50
Paper-Practical	3 hrs.	50	50

Notes :

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in the examination.
2. There will be a common paper for Science/Arts.
3. One question (question No.1) of 20% marks of the total : Question No.1 will be compulsory and will cover the entire course contents of the paper. Question be set in two Parts :-
 - (a) Question on Map (to be supplied) of 10% marks.
 - (b) Question on objective type (Multiple choice and very short answer) of 10% marks.
4. Nine questions will be set in total with three questions from each section.
5. Candidates will attempt five questions in all selecting at least one question from each section.
6. The allocation of marks will be different in Science/ Arts.
7. Practical examination will be conducted by the Board of Examiners.
8. The candidate has to pass both in theory and practical separately.

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PAPER-I : ASIA

Section-A

General Geography. Asia in the context of the World.

Land : Relief, structure major river systems, vegetation, soils, minerals and power resources.

Population distribution, density and growth.

Economy : Agriculture : Main characteristics of Asian Agriculture, distribution and production of crops : wheat, rice, millets, sugarcane, tea, cotton, oilseeds, etc. place of livestock in Asian agriculture, problems of Asian agriculture and their possible solutions.

Section-B

Fisheries : Distribution and production. **Industries :** Distribution, factors of localisation, production and problems : iron and steel, textile, chemical, engineering goods and automobile, sugar, forest-based industries, etc.

Transport and International Trade : Modes of transport and the transport network, composition and direction of international trade, major international Ports.

Section-C

Regional Geography : Japan, China, Pakistan & Iraq. Study of major regions of each country.

Books Recommended :

1. Rawson, R.R. : Monsoon Lands of Asia, Hutchinson Educational Ltd., 1963.
2. Spencer, Joseph Thomas, and William, L. : Asia East by South : A Cultural Geography, John Wiley & Sons, New York, 1971.
3. Trewartha, G.T. : Japan : A Physical, Cultural and Regional Geography, Methuen & Co., London, 1961.
4. Fisher, Charles, A : South East Asia, Methuen & Co., London.
5. Chiao-nim Hsieh : China, Ageless land and Countless People. Van Nostrand, New York, 1967.
6. Singh, R.L. (Ed.) : India : A Regional Geography : National Geographical Society of India, Varanasi 1971.
7. Kolb, A : East Asia, Nethuen Co. Ltd., London, 1981.

Reference Books :

1. Ginsburg, N. : The Pattern of Asia, Prentice Hall, Englewood-Cliffs, 1958.

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2. Spencer, Joseph : Oriental Asia : Themes Toward a Geography, Prentice-Hall, Englewood Cliffs, NJ 1973.
3. Farmer, B.H. : An Introduction to South Asia, Methuen and Co. Ltd. London, 1983.
4. Johnson B.L.C. : South Asia, Hememaim Education Book Ltd., London, 1982.
5. Cressey, G.D. : Land of the 500 Million, McGraw Hill, London, 1955.
6. Ackerman, E.A. Japan's Natural Resources and their Relation to Japan's Economic Future University of Ducago Press, 1953.

PAPER-II : Geography of India

Section-A

India in the context of Southeast and South Asia, India : a land of diversities, unity within diversities.

Major terrain elements of India and their role in shaping physical Land-landscape of India. Drainage systems of India and their functional significance. The morphological regions of India.

Regional and Seasonal variations of climate—the monsoon, western disturbance, norwesters. Climatic regions of India. Soil types of India—the distribution and characteristics. Vegetation types and their distribution.

Forests, minerals and power resources—The status of their use and need for conservation.

Section-B

Spatial distribution of population and density; socio-economic implications of population explosion, urbanization, changing nature of Indian economy. Agricultural growth during the plan period. Green revolution vis-a-vis traditional farming. Regionalisation of Indian agriculture and topology of agricultural regions and their relevance to agricultural development planning.

Industrial development and Indian economy- Industrial regions of India and their industrial structure, composition of domestic and international trade.

Section-C

Basis of regional divisions of India-macro, meso and micro-

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regions of India-their comparative analysis. Resource regions of India. Regional planning of rural and urban regions.

Contemporary issues regional disparity, poverty, population explosion, globalization. Impact of development on Environment-social and ethnic tension, gender discrimination and empowerment of women.

Suggested Reading :

1. Deshpande C.D. : Indian-A Regional Interpretation, Northern Book Center, New Delhi, 1992.
2. Farmer, B.H. : An Introduction to South Asia, Methuen, London, 1983.
3. Govt. of India : India-Reference Annual, 2001 Pub. Div., New Delhi.
4. Govt. of India : National Atlas of India NATMO Publication, Calcutta.
5. Govt. of India : The Gazetteer of India. Vol. I & III, Publication Division.
6. Learmonth. A.T.A. et. al (ed.) Man and Land of South Asia, Concept.
7. Mitra, A: Levels of Regional Development India Census of India, Vol. I, Part I-A (i) and (ii) New Delhi, 1967.
8. Routray, J.K. : Geography of Regional Disparity, Asian Institute of Technology, Bangkok, 1993.
9. Shafi, M : Geography of South Asia, Memillan & Co. Calcutta, 2000.
10. Singh, R.L. (ed.) : India : A Regional Geography . National Geographical Society. India Varanasi, 1971.
11. Spate, O.H.K. and Learmonth, A.T.A. India and Pakistan-Land, People and Economy, Methuen & Co. London, 1967.
12. Wadia, K.S. : Dynamic Himalaya, University Press, Hyderabad, 1998.

PRACTICAL

Scheme :

Max. Marks 50

Min. Pass Marks : 18

Map Projections : Definition, Classification, Identification and suitability of map projection according to objectives. Theoretical

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knowledge of Remote Sensing techniques. Construction (graphical), properties and uses of the projections.

Cylindrical : Simple, Equal area, Mercator's Gall's Conical : One standard Parallel, Two Standard parallels, Bonne's Polyconic.

Zenithal : Gnomonic, Stereographic, Orthographic, Equidistant, Equal area (Polar cases only)

Three dimensional Diagrams : Block piling Spheres, and Still-Gen-Bauer and Stand-de-Geer methods.

Plane Table Survey : Radiation and intersection Resection : various instruments and their uses. Merits and demerits of plane table survey.

Indian Pattern clinometer : Its parts and use, finding out of heights in the field.

Distribution of marks for the Purpose of Examination.

1. Written Test	3 hrs.	24 Marks
2. Record-&-Viva	2 hrs.	12(7+5) Marks
3. Field Survey	2½	14(9+5) Marks
Viva		
Total	5 hrs.	50

Note :

1. The candidate will have to attempt 3 questions out of 5 questions.
2. The Non-collegiate students will have to complete the practical work in consultation with the Head Department of Geography at any one of the affiliated colleges of Rajasthan University in which Geography subject as taught and in the case of non-collegiate students appearing at examination from any examination centre located in Jaipur city the practical camp shall be conducted by the University post graduate Deptt and the candidates will procure a certificate in this regard to be produced at the time of practical examination.

Books Recommended :

1. Kellaway, George, P. : Map projection, Mathuen & Co. London.
2. Steers, J.A. : Map Projections, University of London, Press, London.
3. Singht, R.L. : Practical Geography, Kalyani, Publisher, New Delhi.
4. NATIMO (G.D.I.) : National Atlas of India, NATOMO Calcutta.

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5. Puri, G.S. : Indian Forest Ecology, Volumes I and II Oxford Books and Stationary Co., New Delhi, 1968.
6. Sdasyuek, G. and Sengupta, P. : Economic Regionalisation of India. Census of India, Publication, Delhi, 1960.
7. Sharma, T.R. : Location of Industries in India, Hindi Kitab, Bombay, 1949.
8. Singh, R.L. (Ed.) India : Regional Studies, Published for the 21st International Geographical Congress held at New Delhi, 1968.
9. Singh, R.L. (Ed.) : India : A Geography, National Geographical Society of India, Varanasi, 1971.
10. Spate, O. H.K. and Learrfoth, A.T.A. : India and Pakistan and People and Economy, Mathuen & Co., London, 1967.
11. Srivastava, M.A. : Trade of India, S. Chand & Co., Delhi, 1967.
12. V.C. Mishra : Geography of India Rajasthan, National Book Trust, Delhi.
13. Wadia, D.N. : Geology of India, Macmillan & Co., London, 1967.
14. Wadia, Mehar and Wadia, D.N. : Minerals of Indian, National Book Trust, New Delhi, 1966.

Reference Books :

1. Garmett, William : Map Projections, George Phillip & Sons London.
2. Jameson, A.H. & Ormsby, M.T.T. . Mathematical Geography, Bol., 1, Issac Pitman & Sons London.

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8. APPLIED STATISTICS

Marks

Paper	Nomenclature	Science	Arts	No. of hours per week
Paper-I	Sample Survey	50 Mark	65 Mark	3 hours
Paper-II	Design of Experiments and Computational Techniques	50 Mark	65 Mark	3 hours
Paper III	Practical based on Paper-I & Paper-II	50 Mark	70 Mark	3 hours

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SYLVIA CHATTERJEE (Acad. II)
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Syllabus : B.Sc. Part-III

Total	150	200	09 hours
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Note: In each questions paper, 10 (ten) questions will be set having 2 (two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

APPLIED STATISTICS

Paper-I

(Sample Surveys)

(Also common with Subject-Statistics)

Unit-I

Concepts of population and sample, need for sampling, census & Sample surveys. Advantages of sample survey over complete enumerations. Principles of sample survey, Sampling and non-sampling errors. **18 hours**

Unit-II

Probability and non-probability sampling : Methods of drawing a random sample from finite population, accuracy and precision of an estimator. Simple random sampling with and without replacement, probability of selecting any specified unit in the sample, simple random sampling of attributes. size of simple random sample for a specified precision. **18 hours**

Unit-III

Stratified random sampling : Meaning and advantages of Stratified Random Sampling. Estimation of the population mean and its variance. Optimum and proportional allocation and their comparison with SRS WOR. **18 hours**

Unit-IV

Systematic Sampling : Meaning and sample selection procedures, advantage and disadvantages, variance of the estimated mean, Comparison of systematic with (i) SRSWOR and (ii) stratified random sampling. Cluster sampling (of equal size): Meaning advantages and disadvantages, estimation of population mean. **18 hours**

Unit-V

Ratio Method of estimation (first approximation only) : Meaning, bias of ratio estimators, variance, efficiency of ratio estimate, with SRSWOR estimate. Regression method of estimation (first approximation) : Meaning, Simple Regression Estimate, expected value and variance of simple regression estimate. Comparison with SRSWOR and ratio estimators. **18 hours**

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References:

1. Des Raj (2000) : Sample Survey Theory. Narosa Publishing House.
2. Murthy, M.N. (1967) : Sampling Theory and Methods. Statistical Publishing Series Surveys Designs. Wiley Eastern Ltd.
3. Singh Doroga & Chaudhary, F.S. (1989) : Theory and analysis of sample survey design, Wiley Eastern Ltd.
4. Sukhatme et al. (1984) : Sampling Theory of Surveys with Applications. Indian Society of Agricultural Statistics.
5. Goon A.M., Gupta M.K. Das Gupta B (1986) : Fundamentals of Statistics, Vol-II, World Press, Kolkata.
6. Gupta S.C., Kapoor V.K. : Fundamentals of Applied Statistics, Sultan chand & Sons., New Delhi

Additional References :

1. Sampath S. (2000) : Sampling Theory and Methods. Narora Publishing House.
2. Singh R, Mangal N.S., (1987) : Introduction to Sampling. Kanwer Publication.

Paper-II

Design of Experiments and Computational Techniques
(Also common with Subject- Statistics)

Unit-I

Analysis of Variance : Linear model & its different types (only introduction), Analysis of Variance technique, ANOVA for one-way and two-way classified data (with one observation per cell & fixed effects model) ; Least Square Estimates of Sum of squares, Effects of violations of basic assumptions of ANOVA; Transformations, Critical Difference. 18 hours

Unit-II

Design of Experiments : Need for design of experiments, fundamental principles of design of experiments, Uniformity Trials, Choice of size and shape of plots, Basic designs (with one observation per cell & fixed effects model)-Completely randomized design (CRD), Randomised block design (RBD)- Their advantages and disadvantages & usage. Efficiency of RBD over CRD. 18 hours

Unit-III

Latin Square design (LSD) : Analysis ; least square estimates; expectation of sum of squares; efficiency of LSD over CRD & RBD

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Syllabus : B.Sc. Part-III

Missing plot technique-Estimation of single missing value in RBD & LSD. Factorial experiments- 2^2 , 2^3 , experiments. illustrations, main effects. interaction effects & their analysis 18 hours

Unit-IV

Computational Techniques : Historical evolution of Computers. classification of Computers. Hardware Block Diagram of PC. Input/output Devices. CPU. Software-System Software. Application software operating system-types and Functions of an Operating system MS-DOS - internal & External Commands. Windows : Graphical User interface. Control Panel, find Features. Windows Explorer. Creating, Copying Folders and Files and Creating Short Cuts, Delete and Undelete Files. 18 hours

Unit-V

Programming Concepts : Types of Programming Language. Programming techniques. Drawing Flow charts and Algorithms. Structured Programming Techniques. Development of Flow Chart and Algorithms for Simple Mathematical & Statistical Problems like Computation of Mean, Median, Mode, Standard Deviation, Correlation Coefficient. 18 hours

References :

1. Das M.N. & Giri (1986) Design and Analysis of Experiments. Springer Varlag
2. Goon A.M., Gupta M.K., Das Gupta B (1986); Fundamentals of Statistics, Vol-II World Press Kolkutta
3. Gupta S.C., Kapoor V.K. : Fundamentals of Applied Statistics Sultan Chand & Sons., New Delhi
4. Nagpal D.P. : Computer Fundamentals. Wheeler Publishing. New Delhi.
5. Ram, B : Computer Fundamentals, New Age International Ltd & Publisher
6. Norton Peter : Peter Norton's Introduction of Computers, Tata McGraw hills.
7. Stallings : Operating Systems, PHI

Additional references

1. Kamphrone O. (1965) : The Design and Analysis of Experiments, Wiley Eastern

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2. Cochran W.G. and Cox G.M. (1957) : Experimental Design
Paper-III

Practical Paper

(Also Common with Subject-Applied Statistics)

Course contents are same as of Subject :Statistics Paper-III

1. To draw a SRS with and without replacement. to obtain an estimate of the population total along with the estimates of their variances. Comparing the efficiency of SRSWR with SRSWOR. Finding of confidence interval for the population mean.
2. To draw all the possible samples by SRS-technique and that to show that expected value of the sample mean equals the population mean, to show expected value, $E(\bar{s}^2) = S^2$ in SRSWOR.
3. Stratified sampling (i) estimate the sample sizes by (a) proportional allocation (b) Neyman optimum allocation (ii) estimate the mean to the population under the above scheme (iii) calculation of the sampling variance (iv) Comparison of efficiencies of the allocation scheme amongst themselves as well as with SRS.
4. Systematic sampling
5. Cluster sampling.
6. Ratio & Regression methods of estimation.
7. Analysis of one way classification (CRD).
8. Analysis of two way classification (RBD).
9. Analysis of LSD.
10. Efficiency of RBD over CRD.
11. Efficiency of LSD over CRD & RBD.
12. Analysis of 2^2 & 2^3 factorial design.
13. Construction of Flowcharts and Algorithms for Statistical Problems.

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9. STATISTICS

Paper	Nomenclature	Science	Arts	Marks
Paper-I	Sample Survey	50 Mark	65 Mark	
Paper-II	Design of Experiments and Computational Techniques	50 Mark	65 Mark	
Paper III	Practical based on Paper I,II	50 Mark	70 Mark	
Total		150	200	

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Syllabus : B.Sc. Part-III

Note: In each Question paper, 10 (ten) questions will be set having 2 (two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

Subject : Statistics

Paper-I (Sample Surveys)

(Also common with Subject- Applied Statistics)

Unit-I

Concepts of population and sample, need for sampling, census & sample surveys. Advantages of sample survey over complete enumerations, Principles of sample survey, Sampling and non-sampling error. **18 hours**

Unit-II

Probability and non-probability sampling : Methods of drawing a random sample from finite population, accuracy and precision of an estimator. Simple random sampling with and without replacement, probability of selecting any specified unit in the sample, simple random sampling of attributes, size of simple random sample for a specified precision. **18 hours**

Unit-III

Stratified random sampling : Meaning and advantages of Stratified Random sampling, Estimation of the population mean and its variance. Optimum and proportional allocation and their comparison with SRS WOR. **18 hours**

Unit-IV

Systematic Sampling : Meaning and sample selection procedures. advantages and disadvantages, variance of the estimated mean, Comparison of systematic with (i) SRSWOR and (ii) stratified random sampling. Cluster sampling (of equal size) : Meaning, advantages and disadvantages, estimation of population mean. **18 hours**

Unit-V

Ratio Method of estimation (first approximation only) : Meaning, bias of ratio estimators, variance, efficiency of ratio estimate with SRSWOR estimate Regression method of estimation (first approximation) : Meaning, Simple Regression Estimate, expected value and variance of simple regression estimate. Comparison with SRSWOR and ratio estimators. **18 hours**

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References:

1. Des Raj (2000) : Sample Survey Theory. Narosa Publishing House.
2. Murthy, M.N. (1967) : Sampling Theory and Methods. Statistical Publishing seems Surveys Designs. Wiley Eastern Ltd.
3. Singh, Daroga & Chaudhary, F.S. (1989) : Theory and analysis of sample survey Designs, wiley Eastern Ltd.
4. Sukhatme et al. (1984) : Sampling Theory of Surveys with Applications. Indian Society of Agricultural Statistics.
5. Goon A.M., Gupta M.K. Das Gupta B (1986) : Fundamentals of Statistics, Vol-II, World Press, Kolkata.
6. Gupta S.C., Kapoor V.K. : Fundamentals of Applied Statistics, Sultan Chand & Sons., New Delhi.

Additional References :

1. Sampath S. (2000) : Sampling Theory and Methods. Narora Publishing House.
2. Singh R, Mangal N.S., (1987) : Introduction to Sampling. Kanwer Publication.

Paper-II

**Design of Experiments and Computational Techniques
(Also common with Subject Applied Statistics)**

Analysis of Variance: Linear model & its different types (only introduction), Analysis of Variance technique, ANOVA for one-way and two-way classified data (with one observation per cell & fixed effects model) ; Least Square Estimates of Sum of squares, Effects of violations of basic assumptions of ANOVA; Transformations, Critical Difference. 18 hours

Unit-II

Design of Experiments : Need for design of experiments, fundamental principles of design of experiments, Uniformity Trials, Choice of size and shape of plots, Basic designs (with one observation per cell & fixed effects model)- Completely randomized design (CRD), Randomised block design (RBD)- Their advantages and disadvantages & usage. Efficiency of RBD over CRD. 18 hours

Unit-III

Latin square design (LSD) : Analysis ; least square estimates;

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Syllabus : B.Sc. Part-III

expectation of sum of squares; efficiency of LSD over CRD & RBD. Missing plot technique- Estimation of single missing value in RBD & LSD. Factorial experiments- 2^2 , 2^3 experiments, illustrations, main effects, interaction effects & their analysis. 18 hours

Unit-IV

Computational Techniques : Historical evolution of Computers, classification of Computers. Hardware Block Diagram of PC. Input/output Devices. CPU. Software-System Software. Application software Operating system, Types and Functions of an Operating system. MS-DOS-internal & External Commands, Windows: Graphical Users interface, Control Panel, find Features, Windows Explorer. Creating, Copying Folders and Files and Creating Short Cuts, Delete and Undelete Files. 18 hours

Unit-V

Programming Concepts : Types of Programming Language. Programming techniques. Drawing Flow charts and Algorithms. Structured Programming Techniques. Development of Flow Chart and Algorithms for Simple Mathematical & Statistical Problems like Computation of Mean, Median, Mode, Standard Deviation, Correlation Coefficient. 18 hours

References :

1. Das M.N. & Giri N.E. (1986) : Design and Analysis of Experiments. Springer Verlag
2. Goor A.M., Gupta M.K. Das Gupta B (1986) : Fundamentals of Statistics, Vol-II. World Press Kolkutta
3. Gupta S.C. Kapoor V.K. : Fundamentals of Applied Statistics. Sultan Chand & Sons.. New Delhi.
4. Nagpal D.P. : Computer Fundamentals, Wheeler Publishing. New Delhi
5. Ram, B : Computer Fundamentals, New Age International Ltd. & Publishers
6. Norton Peter : Peter Norton's Introduction of Computers. Tata McGraw hills.
7. Stallings : Operating Systems. PHI

Additional References

1. Kamphrone O. (1965) : The Design and Analysis of Experiments. Wiley Eastern.

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2. Cochran W.G. and Cox G.M. (1957) : Experimental Design, John Wiley and sons.
3. Kalicharan : An Introduction of Computer Studies, Cambridge Press.

**Paper-III
Practical Paper**

(Also common with Subject-Statistics)

1. To draw a SRS with and without replacement to obtain an estimate of the population total along with the estimates of their variances., Comparing the efficiency of SRSWR with SRSWOR. Finding of confidence interval for the population mean.
2. To draw all the possible samples by SRS-technique and that to show that expected value of the sample mean equals the population mean, to show expected value, $E(\bar{s}^2) = S^2$ in SRSWOR.
3. Stratified sampling (i) estimate the sample sizes by (a) proportional allocation (b) Neyman optimum allocation (ii) estimate the mean to the population under the above scheme (iii) calculation of the sampling variance (iv) Comparison of efficiencies of the allocation scheme amongst themselves as well as with SRS.
4. Systematic sampling.
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6. Ratio & Regression methods of estimation.
7. Analysis of one way classified (CRD).
8. Analysis of two way classification (RBD).
9. Analysis of LSD
10. Efficiency of RBD over CRD.
11. Efficiency of over CRD & RBD.
12. Analysis of 2^2 & 2^3 factorial design.
13. Construction of Flowcharts and Algorithms for Statistical Problems.

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10. PSYCHOLOGY

B.A./B.Sc./ Pt. III

Scheme :

Art

Science

Min. Pass Marks

72 (Th. 54 Pr. 18)

54 (Th. 36 Pr. 18)

Max.Marks

200

150

Paper-I	3 hrs. duration	Arts. 75
	Psychological Assessment	Science 50
Paper-II	3 hrs. duration	Arts. 75
	Human Development	Science 50
Paper-III	3 hrs. duration	Arts. 50
	Practicals	Science 50

Note : There will be three papers in Psychology, Each paper will be of 3 hours. There will be a common paper for Arts and Science. In I and II paper. Question No. 1 will be compulsory and will cover the entire course contents of the paper, Question No.1 will contain two parts A & B. A part of 1 question will contain 20 questions of multiple choice. Each question will be of 3/4 marks for Arts students and of 1/2 marks for Science students. Thus A part will be of 15 marks for Arts students and of 10 marks for Science students. B part will contain 10 questions to be answered in the limit of 20 words. Each question of B part will be of 1 1/2 marks for Arts students and of 1 mark for Science students.

~~Thus B part will be of 15 marks for Arts students and of 10 marks for Science students. Separate question paper for this objective type will be provided to each student and answers will be given in this question paper only in the space provided in the objective type question paper. Candidates will be given one hour to attempt this first compulsory question out of three hours in total time allotted for this paper. Thus total marks allotted for Arts students for first part will be 30 and for science students 20.~~

In the second part of the question paper, three question of essay type will be attempted selecting atleast one from each section. Each question will be of 15 marks for Arts students and 10 marks for science students. Two hours will be given for attempting this part.

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B.A./ B.Sc. Pass Course Part-III

Paper-I: Psychological Testing and Assessment

Section-A

1. **Human Assessment: Nature and Scope**
2. **Theories of Measurement: Campbell's Theory, Steven's Contribution, Problems in Psychological Measurement.**
3. **Psychological Test Construction: Principles and Steps, Item analysis.**

Section-B

4. **Reliability: Meaning, Types and Methods of Calculating Reliability.**
5. **Validity: Meaning, Types and Methods of Calculating Validity.**
6. **Norms: Meaning and Types of Norms.**

Section-C

7. **Types of Psychological Tests- Group and Individual, Verbal and Performance, Speed and Power Test, Rating Scales.**
8. **Application of Psychological Testing: Educational Counselling and Guidance, Clinical and Organisational Setting.**
9. **Practical and Ethical Issues in Psychological Testing.**

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References Books:

1. Anastasi, A. (1997), Psychological testing, New York; MacMillan Co.
2. Chadha, N.K. (2009). Applied Psychometry, New Delhi: Sage.
3. Kaplan, R.M. and Saccuzzo, D.P. (2009) Psychological Testing and Assessment. New Delhi: Cengage Learning.
4. अरुण कुमार सिंह (2002): मनोविज्ञान मे मापन एवं मूल्यांकन. नई दिल्ली, मोतीलाल बनारसीदास।

Paper-II: Developmental Psychology

Section-A

1. **Human Development: Nature and Scope: Domains and Periods of Development, Longitudinal and Cross-Sectional Researches.**
2. **Foundations of Human Development: Biological, Socio-environmental and Cultural Factors.**
3. **Self and Identity: Self Awareness, Self Concept and Self-Esteem- Cognitive Social and Cultural Influences. Identity: Construction and Influences on Identity Development.**

Section-B

4. **Psychoanalytic and Psychodynamic Theories of Development: Freud's Psychoanalytic, Erikson's Psycho-social, Bowlby's Ethological Theory of Attachment.**
5. **Social Learning and Cognitive Theories of Development: Bandura's Social Learning Theory, Piaget's**

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Cognitive – Stage Theory, Vygotsky's Socio-Cultural Theory, Information Processing and Language Development.

6. **Emotional and Moral Development:** Functions of Emotions, Development of Emotional Expression, Temperament and Development. Moral Development: Piaget's and Kohlberg's Theories.

Section-C

7. **Problem of Adulthood and Aging:** Marriage, Family and Work. Gerontology and Theories of Aging: Damage Theories, Genetic Clock Theories and Bio-Psychosocial Model, Aging disabilities: Physical and Mental.
8. **Developmental Psychopathologies:** Learning Disabilities, Conduct Disorder, Autism, ADHD, MR. (*Mental Retardation*).
9. **Stress and Health:** Nature and Types of Stress, Physiology of Stress, Causes and Consequences of Stress, Stress Management.

Reference Books:

1. Berk, L.E. (2003) Child Development. Delhi, Pearson Education.
2. Santrock, J.W. (1999), Lifespan Development. New York, McGraw Hill.
3. Hurlock, E. (2003) Developmental Psychology. Delhi, Tata McGraw Hill
4. Papalia, S. and Feldman, C. (2002) Adult Development and Aging. Delhi, Tata McGraw Hill.
5. Berk, L.E.(2010) Development through the Life Span. Delhi, Pearson Education.
6. Sigelman, C.K. and Rider E.A. (2003) Life Span Human Development. Thomson- Wadsworth.
7. Mishra, G. (1999) Psychological Perspectives on Stress and Health, New Delhi, Concept.

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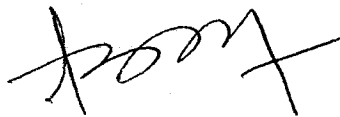
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Paper-III Practicals

1. Raven's SPM
2. Personality Assessment through HSPQ
3. Reaction Time
4. Habit Formation and Interference
5. Social Maturity
6. Emotional Maturity
7. Vocational Maturity
8. Concept Formation
9. Profile of Interests through Interest Inventory
10. One Case Study on Developmental Disorder.

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11. ENVIRONMENTAL SCIENCE

Scheme :

Min. Marks : 36		Max. Marks : 100
Paper-I	3 hrs. duration	Marks 50
Paper-II	3 hrs. duration	Marks 50
Practicals	4 hrs. duration	Max. Marks : 50

Note :

1. Two types of questions papers for each theory paper will be applicable of total duration of 3 hours. One question paper will comprise the objective type of question and the other will be of descriptive long answer type of question.
2. Descriptive type of question paper (to be given during the first two hours of the examination) will have 6 question out of which a student is supposed to attempt any 3. This portion of the paper will carry maximum 30 marks.
3. The objective type question paper will be given after 2 hours of descriptive type paper and will have 35 questions of the objective types. This portion of the paper will carry maximum 20 marks.

the objective type of question will be of the following types :

- Multiple choice type question 20 of 1/2 marks each.
- Fill in the blanks/one word/true or false type questions 10 of 1/2 marks each.
- Very short answer type question 5 of 1 mark each.

PAPER-I

ENVIRONMENTAL MANAGEMENT AND PLANNING (ABATEMENT TECHNIQUES)

Section-A

Air Pollution Abatement - Air Pollution and meteorology
(Meteorological parameters, vertical motion of air and atmospheric stability, wind rose diagram and wind direction frequency, lapse rate,

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Syllabus : B.Sc. Part-III

temperature inversion, maximum mixing depth. Atmospheric Dispersion, plumes and plume rise. Dispersal of Pollutants.

Section-B

Ambient Air quality Monitoring : Stack gas emission and their measurement, Ambient air and stack gas quality standards, threshold limit values.

Section-C

Air Pollution Control Techniques; control of stationary source emissions-particulate emissions control, gaseous control. Control of mobile sources.

Note :

1. Two types of questions papers for each theory paper will be applicable of total duration of 3 hours. One question paper will comprise the objective type of question and the other will be of descriptive long answer type of question.
2. Descriptive type of question paper (to be given during the first two hours of the examination) will have 6 question out of which a student is supposed to attempt any 3. This portion of the paper will carry maximum 30 marks.
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the objective type of question will be of the following types :

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- Fill in the blanks/one word/true or false type questions 10 of 1/2 marks each.
- Very short answer type question 5 of 1 mark each.

PAPER-II

ENVIRONMENTAL IMPACT ASSESSMENT & SUSTAINABLE DEVELOPMENT

Section-A

Sustainable Development, Sustainable Industrialisation Sustainable Agriculture, Sustainable Housing, Sustainable Tourism and Transport, Sustainable Mining.

Section-B

Environmental Impact Assessment; Processes and Methodologies. Industrial plant location and city planning.

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Section-C

Concept of Environmental Auditing & Accounting. Environmental Acts and Legislation. Environmental Economics. (cost benefit analysis).

Practicals: Based upon theory papers.

Environmental Education and Awareness.

Krebs, C.J. 1985. Ecology, Harper and Row Publisher, New York.

Majumuria, T.C. 1986. Wildlife wealth of India geq press Bangkok.

Odum, E.P. 1983 Basic Ecology. Saundus College publishing, New York.

Prakas, I. 1988. Desert Ecology. Scientific Publishers.

Seshadri, B. 1986 India's wildlife Resources. Stending Publishers Pvt. New Delhi.

Smith, R.L. Elements of Ecology. Horper and Row Publishers, New York.

Jeague, R.D. 1985. Manual of wildlife conservation. Natraj Publishers, Dehradun.

Tietenberg, To 1968. Environmental and Natural Resources Economics, Scott, Foresman & Co. London.

Fundamentals of Environmental Science:

Allaby, M. 1986 Ecology Facts. Bridge House London, Kd, Twickenham, Middlesex.

Beez, A.V. Knamitter, G.W. and Smith, J.C. 1987. The Environmental Science and Technology Education. Pergmon Press, Oxford.

Betaking. D.B. and Killer E.A.F. 1982. Environmental Studies. Charles E. Merrill Publishing Co. London.

Cassedy, E.S. and Grossman, P.Z. 1990. Introduction to energy. Cambridge University Press, New York.

Colinvaux, P. 1986. Ecology. John Wiley and sons, New York.

Dicastri, F. Banker, FWG and had by, M. 1984. Ecology in practice.

Jycooly International Publishing Ltd., Dublin.

Pollution

Environmental Impacts of Water Resources Project.

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Syllabus : B.Sc. Part-III

- Discovery Publishing Home, New, Delhi.
Banergjee, B.N. 1987. Environmental Pollution and Bhopal Killings, Gian Publishing House, New Delhi.
Chatwal, G.R. Mehra, C.S., Satake M. Kalya, M. and Naga hiro, T. 1989.
Environmental Radiation and Ther and Pollution and their control Acol Publication, New Delhi.
Nath, P. and Nath, S. 1990 Environmental Pollution conservation and Planning. Chng. Publication, Allahabad.
Sinha, U.K. 1986. Ganga Pollution and health hazards, Alka Enterprise. New Delhi.
Tebbntt, T.H.Y. 1983. Principles of water quality control. Pragmon Press, Oxford.

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- Alvares, C. and Billorey, R. 1988. Damming the Narmad. Natraj Publisher, Dehradun.
Bourne P.G. 1984. Wale and Sanitration. Academic Press. Inc. New York.
Gupta, C.P. 1989, Appropriate methodologies for development & Management of ground water resources in developing countries. IBH Publishing Co. Pvt. Ltd., New Delhi.
Fik Sel, J. and Covello. V.T. 1986. Biotechnology, Risk assessment. Pergamon Press, New York.
Forsteb, C.F. 1985 Biotechnology and waste water treatment. Cambridge University press, London.
Prentis, S. 1984. Biotechnology: A New Industrial Revolution. Orbis Publishing, London.
Primrose, S.B. 1987. Modern Biotechnology. Blackwell Oxford.
Rana, S.V.S. 1986 Recent trends in Biotechnology and biosciences. Pragati Press. Muzzafarnagar.
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12. ELECTRONICS

Scheme :

Min Pass. Marks : 36

Max. Marks-100

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Syllabus : B.Sc. Part-III

Paper-I	3 hrs.	33
Paper II	3 hrs.	33
Paper III	3 hrs.	34
Practical Min. Pass. Marks: 18	5 hrs.	50

Paper-I-Communication and Radio Electronics

Note: The paper will be divided into five units. Two questions will be set from each unit. Five questions are required to be attempted in all. The candidate is required to attempt one question from each unit:
Max.Marks : 33 **Time : 3 hrs.**

Unit-1

Modulation

Need of a carrier frequency, AM, FM, PM, AM side bands, power consideration, Collector and base modulations, SSB transmission FM by reactance variation using Semiconductor devices. The Arnistrong FM system. Block diagram of AM and FM transmitters: Merits of FM transmission over AM transmission.

Unit-2

Demodulation:

Demodulation of AM signals, Square law demodulation. Linear envelope deduction AGC demolition of FM signals. Amplitude limiter. Foster seeley frequency discriminator and ratio detector.

Unit-3

Transmission lines and Associated distributive parameters

Propagation of voltage and current waves on the line (Differential equations and their solution). Characteristic impedance. Propagation constant and losses, Reflection coefficient, Standing wave ratio (SWR), resonant $\lambda/4$ and $\lambda/2$ lines.

Unit-4

Impedance matching and Radiation of EM Waves

Single stub matching, Smith chart and its uses. Elementary idea of transmission of microwave signal and wave guides. Dipole antenna. Radiation resistance and directivity of an antenna. Radiation from a quarter wave monopole or half wave dipole linear arrays. Propagation of EM wave in space. Types of wave propagation through ionosphere, Critical angle ground wave range. Skip distance and skip zone. Different layers in ionosphere.

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Unit-5

Radio Receivers and Tape Recorders

AM radio receiving systems. Superheterodyne, FM receivers and their measurements. Stereo transmission and reception. Characteristics of various types of recording tapes. Recording head, Principles of recording playback and erasing tape transport system Hi-Fi and stereophony recording tune table.

Reference Books suggested

1. Gordon J. King, The Hi-Fi and taperecorder handbook. N Butterworths, London.
2. G.K. Mithal-Elements of Electronics, Khanna Publishers, Delhi.
3. Handbook of Electronics by Kumar & Gupta-Pragati Prakashan, Meerut.
4. Electromagnetic waves and radiative systems-E.L. Jordan.
5. Electron tube circuits-Sammuel Seeley.

Paper-II : Television Electronics .

Note : The paper will be divided into five units. Two questions will be set from each unit. Five questions are required to be attempted in all. The candidate is required to attempt one question from each unit.

Max. Marks-33

Time : 3 Hrs.

Unit-1

Picture scanning, Broadcast channels, Frequency band and resolution, camera tubes, Block diagram of transmitter and explanation of each block, colour transmission.

Television receiver : Scanning sequence and interlacing, synchronization and blanking.

Unit-2

Block diagram of colour and monochrome receivers and explanation of each block.

Sound system, Transient response of TV receivers.

Mosaic, Exhaust and activation schedule performance tests. Theory of operation, characteristics of the Mosaic, potential distribution of the mosaic. The Mosaic under the influence of a height in age. The formation of the video signal, Line sensitivity.

Black spot performance of the Iconoscope. Limiting sensitivity.

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Syllabus : B.Sc. Part-III

Depth of focus. Pick-ups for motion picture films. The type RCA 185 OA Iconoscope.

Limiting sensitivity of pick-up devices. The two sided target. Low velocity scanning. The orthicon. The image iconoscope multi-stage. Image multiplier pick-up tubes, signal multiplication image orthicon. Performance of the image orthicon.

Unit-4

The Isocon. Photoconductive pick-up tubes. The storage tube. The monoscope. Conclusion.

Requirement of the Kinescope. Construction of the Kinescope bulbs, round glass tubes, metal tube-bulbs, rectangular tubes. The electron gun. The fluorescent. Screening procedure. Metal backing of Kinescope screens. Processing of the Kinescope. Tests and performance. Contrasts. Direct view Kinescope. Projection Kinescope.

Unit-5

Colour signals. Colour addition. Definition of colour TV signals. I, R- Y. and GY signal, desaturated colours, the transmitted chrominance signal. Matrix circuits. Colour subcarrier frequency. Colour synchronization. Colour pleased composite video signal waveforms. Vector addition of colour signals. Colour picture tubes.

Reference Books suggested

1. Blenn M. Glasford : Fundamentals of television engineering.
2. M. Kive-Television simplified 6th edition.
3. B. Goobi-Basic television principles and servicing.

Paper-III-Electronic Instruments and Measurements.

Note : The paper will be divided into five units. Two questions will be set from each unit. Five questions are required to be attempted in all. The candidate is required to attempt one question from each unit.

Max. Marks : 34

Time : 3 hrs.

Unit-1

Measuring and test instruments, Fabrication Technique

AC Voltmeter, ammeter, Ohm meter (Shunt and series type), Multimeter, Analog and digital voltmeter, Watt meter, Frequency meter, Q meter, C.R.O. as test instrument.

Fabrication of PN Junction Diode, PNP transistor, Fabrication of an I.C. transistor, Equivalent circuit, integrated diode, integrated capacitor, junction capacitor, thin film capacitor integrated resistor, Thin film resistor. Three pin regulators, Timing concept and Timer 555.

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Unit-2

Power Electronics

Silicon controlled rectifier (SCR), working of SCR, Equivalent circuit of SCR, V-I characteristic of SCR, SCR Half wave and full wave rectifier. Applications of SCR. The triac, Triac construction and operation, Triac characteristics, Application of Triac, The Diac, Application of Diac, Unijunction Transistor (UJT). Equivalent circuit of UJT, Characteristics of UJT, Application of UJT.

Unit-3

Tape Recorder:

Mechanism of Recording, various head of the tape recorder, Record/Play back head, Erase head, High frequency erase head, low frequency erase, Bulk erase, Practical Tape recorder, Tape machines, Fault finding in the tape recorder, Care and maintenance.

Unit-4

Transducer

Classification, Strain gauge, Displacement transducers, capacitive transducers, Photoelectric, Piezoelectric and temperature Transducers, Self generating Inductive Transducer, Linear variable Differential Transformer (LVDT),

Unit-5

Thermal and optical transducer

Resistance thermometer. Thermocouple, thermistors and their applications.

Optical transducers—Vacuum phototube, Gasfilled phototube, Photomultiplier tube, Photoconductive cell, Photovoltaic Cell.

Various Types of Microphones.

Reference Books Suggested

1. Electronic Circuits—Discrete and Integrated, Shilling and Belon, McGraw Hill.
2. J. Glaser and J. Subak Sharpe, Integrated Circuit Engineering Addition Westley 1978.
3. Principle of Electronics, V.K. Mehta.
4. Basic Electronics & Solid State, B.L. Theraja.
5. Radio & Television, N.C. Goyal and S.K. Mukherjee.

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Syllabus : B.Sc. Part-III

Experiments For Practical Work

Note : A candidate has to perform at least sixteen experiments in all taking eight experiments from each section 'A' and 'B'. In practical examination, the candidate will be required to perform two experiments : one from section 'A' and the other from section 'B'. The distribution of Marks will be as follows -

Time duration-5:00 hrs Expts. (Two)-30 (15 for each expt.) marks

Viva Voce	10 marks
Practical record	10 Marks
Total	50 marks.
	Max. Marks-50

Section-A

1. To design and study free running multivibrator (transistorised) of given frequencies.
2. To design active band pass filter of given cut off frequencies and study its frequency response.
3. To study regulated power supply using a Zener diode and an electronic SCR voltage regulator.
4. To design and study thyatron sawtooth wave generation.
5. To design and study single stage RC coupled transistor amplifier of given cutoff frequencies and mid frequency gain.
6. To design and study UJT sweep circuit.
7. To design and study Hartley oscillator (transistorised) of given frequencies.
8. To design and study pulse coincidence circuit using ICs.
9. To design and study a precision timer circuit using IC 555 chip.
10. To design and study clipping and clamping circuits.

Section-B

1. To study binary adder and subtractor.
2. To study AM signals.
3. To study Darlington pair.
4. To study fourier analysis of square and clipped sine wave.
5. To study Variable reactance modulator.
6. To find out CMRR of differential amplifier.
7. To study the characteristics of SCR.
8. To design and study a precision linear gate using operational amplifier and FET.
9. To find out solutions of simple problems using analog computer.

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10. To design and study voltage comparator using operational amplifier.

Additional Optional Subjects

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13. TEXTILE-CRAFT

Min. Pass Marks : 54		Max. Marks 150
Paper-I	3 hrs. duration	75 Marks
Paper-II	3 hrs. duration	75 Marks
paper-I	Marks	Hours
(i) Theory	25	Theory 3
(ii) Practical	25	Practical 6
(iii) Submission	<u>25</u>	
Total	<u>75</u>	

Theory

- (i) Weaving Theory—Understanding of the working of different types of looms, Hobby and Jacquard.
- (ii) Fabric Study.

Practical (i) Weaving Waves, Practical—Weaving Compounds.

Paper-I	3 hrs. duration	75 Marks
Paper-II	3 hrs. duration	75 Marks
paper-I	Marks	Hours
(i) Theory	25	Theory 3
(ii) Practical	25	Practical 6
(iii) Submission	<u>25</u>	
Total	<u>75</u>	

Theory

- (i) Printing Theory—Preparation of stencils and screens.
- (ii) Detailed study of the methods of printing with stencils and screens

Practical (i) Printing Practical :

1. Block Printing
2. Screen Printing (Enamel paint, lacquer paint)
3. Types of designs of paper for practical

(ii) Developing Designs for Practical :

1. Curtation, 2. Upholstery, 3. Bedsheets & Bed cover. Colour schemes and colour ways for the above.

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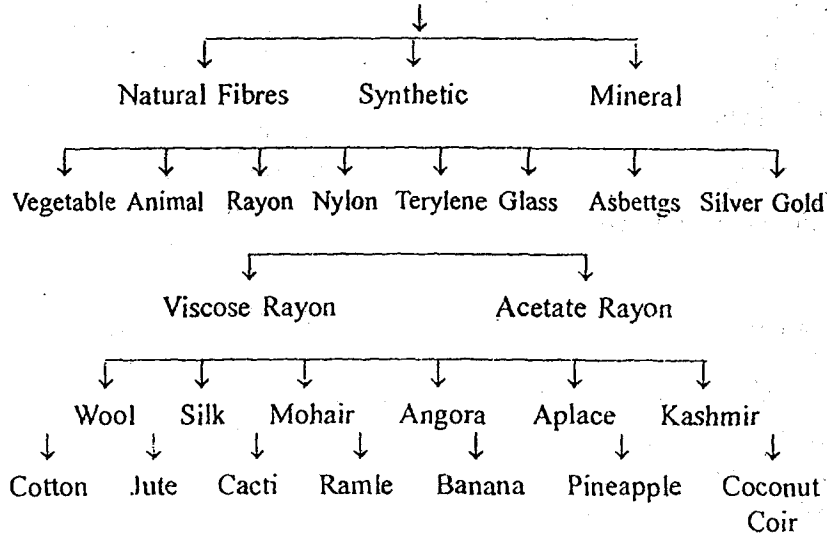
Weaving Syllabus

Fibre

1. (a) What is fibre?

Answer : A fibre is a generic term which forms the basic elements for a fabric

CATEGORIES OF FIBRES



Name of the Synthetic Fibers :

- (1) Vineyon
- (2) Sran
- (3) Soyabena Fibre,
- (4) Cassein fibers
- (5) Ardil
- (6) Rayonlanda etc.

Characteristics of Good Fibre:

Requisite qualities of fibre for marking a fabric.

YARN : (1) Single Yarn, (2) Play yarn (3) Fancy Yarn.

Yarn Numbering :

2 Count

2 Denier

% Tee

- (1) Indirect System of numbering yarns—(Count)
- (2) Direct System of numbering yarns—(Denier)
- (3) Direct system of numbering yarns—(Tee)

Why is the System called indirect system?

What are the advantage of direct system?

Weaving Theory : A brief history of the importance of dress to man from early ages to the present day, Growing of cotton in fields. Plucking of cotton when it is ripe—Removal of seeds from cotton (Gining)—Bailing of Cotton. How cotton is transported to mills.

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Machineries involved in the spinning i.e. converting cotton fibers into yarn machinery Girding Drawing Slubbing Intermediate frames—Spining (Ring Spining), Carditaming Relling-bealing.

Manufacture of Wool—How is wool manufactured?

Wool Fleece—Sheep Washing Shearing Wool sorting, Wool scouring-Drying Teasing, Wool manufacture, Worsted manufacture.

Details of Woolen Manufacture : Willowing-Oiling-Blending-Teasing Carding-Condensing-Roving-Mule Spinning.

Worsted of Manufacture—Preparing Back Wasting-Combing-Drawing-Doubling-Drafting-Twisting & Spinning.

Manufacture of Silk (Pure Silk)—How the silk worms lay its eggs on the backside of Mulberry trees Hatching of eggs Caterpillar state (Larva stage)—In which stage the caterpillar eat plenty of mulberry leaves Pupal stage—

How Pupa is put in hot water in which process the inside worms are killed and how the silk wound on bobbins.

Synthetic or Man made Fiber's

1. **Viscose Rayons :** Important raw materials manufacture of Viscose Rayons : (1) Cellulose, (2) Castic Soda (3) Carbon-di-sulphide acid (4) Sulphuric acid (5) Plentiful supply of water is essential.
Preparation of Spinning Solution. How viscos in spun Acid bath (Wet Spinning)
2. **Acetate Rayons :** Raw materials-Cotton liners which contain plenty of Alpha cellulose, treatment of cellulose with caustic soda i.e. purification of cellulose. Purified cellulose is treated with acetic Acid and Acetic Anhydride, with concentrated Sulfuric acid take cellulose acetate-Dissolve the same in acetone-you get the spinning solution. Spua into hot chambers. You get the yarn which is wound on bobbins-(This is called dry spinning).
3. **Nylon or (Synthetic Polyamid :** Caprolactum chi-pe-Melt the caprolactum to a high temperature : say 400°F to 600°F and spin into yarn. This is called melt spinning.
4. **Terylene :** Treatment of D.N.T. (Dymethyl tellerance and adiotic Acid in an inert atmosphere) you get terylene yarn.

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Name of Other Synthetic Fibres :

1. Vineyon 2. Saran. 3. Soyabean fibre. 4. Ardil 5. Rayolanda etc.

Folded Yarns :

What is a folded yarn?

How are the counts of folded yarn calculated?

Small problems of finding the count of two fold yarn.

For example : 24/40 expresses folded yarn by twisting together two yarn (single threads) one of 24S and another of 40S. This is equivalent to 15S and not the arithmetic mean of 24 and 40 How?

Question : Calculate the count of folded yarn of 24S and 40S. cotton.

Answer : One hank of 24S cotton. —1/24 of a lb
One hank of 40S cotton —1/40 of lb
Hank of folded yarn —1/24 + 1/40

$$= \frac{1 \times 5 + 1 \times 3}{120} = \frac{5+3}{120} = \frac{8}{120}$$
$$= 1/15 \text{ lb} = \text{i.e., } 15\text{S Count}$$

Ans. 150 Count

How to calculate the count of an unknown thread in a three folded yarn where the two component thread and resultant thread are known?

Question : E.G. : A three fold yarn composed of 8S, 24S, and a thread of an unknown hank was found to be 5S cotton. Calculate the count of unknown thread in a three folded yarn where the two component thread and resultant thread are known?

Question : E.G. : A three fold yarn composed of 3S, 24S, and a thread of an unknown hank was found to be 4S cotton. Calculate the count of unknown thread ?

Answer : 1 hank of 3 folded yarn 1/4 a lb
1 hank of 3S thread 1/8 of a lb
1 hank of 24S thread 1/24 of a lb
Therefore one hank of unknown thread

$$1/4 - (1/8 + 1/24)$$
$$= \frac{1 \times 6 - (1 \times 3 + 1 \times 1)}{24} = \frac{6 - (3 + 1)}{24}$$

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$$= \frac{6-4}{24} = \frac{2}{24} = \frac{1}{12} \text{ of a lb} = 12\text{'s cotton}$$

Ans. Count of unknown yarn. 12's cotton.

Fancy Yarns :

1. Snarl yarn, 2. Corkscrew yarn, 3. Slub yarn etc.

Weaving :

What is a weaving? What is a warp? What is weft?

How is a fabric woven?

1. Selection yarn. 2. Count of yarn. 3. Width & length of the fabric 4. To know the total number of warp threads ends.

(a) To know the ends per inch (b) To know the picks per inch.

Preparation of Warp

Requirements for Making a Warp :

1. Yarn in the form of hank.
2. Reel for converting the package from hank to bobbin former.
3. Creel.
4. Lease reed.
5. Condensing reed.
6. Number of sections to be calculated to get the total number of ends as per width of the cloth.
7. Lease to be taken for each section.
8. When the warp is ready, it has to be dropped i.e. it has to be wound on the weavers beam.
9. Drawing of the ends in the wire healds the mechanism which lifts the yarn in a particular style as required for weaving of the cloth.
10. Drawing the yarn on the reed as per reed plan to keep the ends parallel and spread out. You can get the width of the cloth on the reed.
11. Tie up of the shafts to lamps and peddals.
12. Tip up of the warp to the cloth beam.
13. The weft yarn to be wound on the bobbins or pirns which will be fixed in the shuttle for weaving.

Requirements for the Construction of a Fabric.

- | | |
|-------------------------|--------------------------|
| 1. Width of the fabric. | 2. Length of the fabric. |
| 3. Count of warp ends. | 4. Count of weft ends. |
| 5. Ends per inch. | 6. Picks per inch. |

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7. The weave pattern.

Cloth Calculation :

Requirement of yarn for warp
 = Length of warp in yds. × Width of warp in inches × Ends per inch × weight conversion into ounces.

Yarn count × unit length.

Requirement of yarn for weft.

Woven length × Width of × picks per × weight
 in yards warp in inches inch conversion
 to ounces

Yarn count × unit length

Example :

Width of the fabric 36" (8' for sedvedges which are double)

Length of the fabric 50 + 5 yds. (For roller and beam waste)

Count of warp yarn 2/20 S.

Count of weft yarn 2/40 S.

No. of ends per inch 10

No. of picks per inch 15

Reed 20S.

Plain weave

$$\text{Warp : } \frac{55 \times 37 \times 10 \times 16}{(2/20S) 10 \times 840} = 271 \text{ lbs.}$$

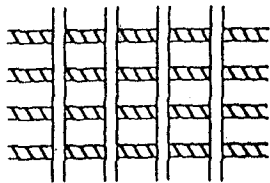
$$\text{Weft : } \frac{55 \times 37 \times 16}{(2/40S) 20 \times 840} = 271 \text{ lbs}$$

What are the basic weaves ?

1. Plain, 2. Twill, 3. Satin.

What is Plain Weave ?

Two sets of yarns are alternately picked up and the weft passed through. this process is done alternately.



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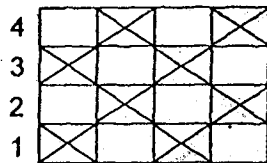
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N.B. If pedales 1 and 3 are tied to one pedal and 2 and 4 tied to another pedal, and the pedals used alternately, captain weave will result.

What is a twill weave ?



Here four, sets to yarns are picked up on the following order. 1 and 2, 2 and 3, 3 and 4 repeat.

Eg. A3 up 3 down twill.

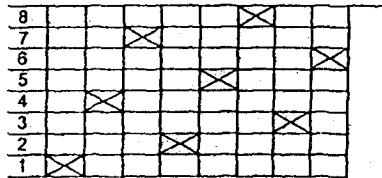
N.B. A cross in the square indicates the warp is up and the weft is down.

What is a Satin Weave?

Eight sets of yarn picked up on the following order :

8, 7, 6, 5, 4, 3, 2, 1.

The reverse of satin weave is called satin weave.



What are the types of loom ?

1. Plain loom, 2. Robbins, 3. Jacquard.

What are the equipments used for the construction of a cloth ?

1. Winding machine for preparing warp bobbins & Pins.
2. Fixed reed for cross ends.
3. Warp beam.
4. Reed hook.
5. Crfeel of Bobbin racks.
6. Worping machine.
7. Loom.
8. Heddlessor healds.
9. Cloth beam.

What are the movements of loom ?

1. Shedding-What is sheadding ?

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Syllabus : B.Sc. Part-III

This is a movement in a loom during which the shafts with the healds move up and down to separate the sets of warp threads to form a shed.

2. **Picking**-What is picking ?

This is a movement in a loom whereby the shuttle with its bobbin of yarn is thrown across the warp ends in the shed.

3. **Beating up**. What is beating up ?

This is a movement of a loom whereby the reed is beaten up which forms the cloth.

4. **Rolling the woven cloth** in the cloth beam.

5. **Releasing the warp** from the warp beam for the weft to be interlaced. The above simple mechanisms are the basis to all the looms except variations arise based on the pattern requirement for heavy or light fabrics.

What are the fabrics generally woven in plain loom ?

- | | | |
|--------------------|--------------------|---------------------|
| (1) Asbestos cloth | (2) Bag cloth | |
| (3) Billiard cloth | (4) Blazer cloth | |
| (5) Buckram | (6) Calender cloth | |
| (7) Calico | (8) Long cloth | (9) Grey cloth etc. |

What are the fabrics generally woven on Dobby Loom ?

In dobbie loom, 4 sets to 32 sets of yarns are woven. This gives geometrical pattern and most of finishing fabrics are woven in this loom.

- (1) Bed covers with geometrical pattern.
- (2) Corduroy.
- (3) Braided fabrics.
- (4) Crepe fabrics.
- (5) Blanket range.
- (6) Khaki Fabrics.
- (7) Gaberdene
- (8) Gents shirting and suiting.
- (9) Drills
- (10) Satin and satten cloth.
- (11) Gauze or leno fabrics
- (12) Reversible fabrics
- (13) Travel materials
- (14) Velvet and velveteens etc.

JACQUARD-What is Jacquard ?

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The famous apparatus designed by Mr. Joseph Marie Jacquard (1752-1834), invaluable in weaving finer kinds of figures silk fabrics. The invention of Jacquard machine is the most important invention applied to hand looms; fabrics generally woven in Jacquard loom.

Tapestry and any of complicated designs.

The dobby loom : How seed is formed-Principle features of a dobby loom mechanism.

Weaving Practical Syllabus

Preliminary :

1. Understanding loom with special mention to all the individual parts.
2. Winding yarn from hank form to bobbin form.
3. Creeling leasing Taking Sections making the warp.
4. Dropping of beams i.e. winding the warp over the weaver beams.
5. Drawing of ends on the peddles or healds.
6. Drawing of ends on the reed.
7. Tying the warp on the weavers beam.
8. Tying of lams and pedals.

1st Lesson in weaving :

- | | |
|------------------|---|
| 1. Plane Weave | Take Samples 10" x 10" variation of plain weave |
| 2. Twill weave | 3. Variations of twill weaves |
| 4. Pointed weave | 5. Diamond weave |
| 6. Honey Comb | 7. Huck a back etc. |

Suggested exercises for Textile Design :

Theme	:	4 ends setin
For	:	Table cloth
Method	:	Frame Loom
Colour Scheme	:	Colour found with 1/3"
Bold stripes	:	3" Apart
Requirement	:	12" x 12" sample
Samples	:	2 meters fabric

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Syllabus : B.Sc. Part-III

- Special feature : (1) Straight draft
(2) E.P.I. continued until exercises 22.

Printing Syllabus

Theory—What is printing?

Styles of Printing :

- (a) Direct style.
- (b) Discharge style.
- (c) Resist style :
 - (a) Direct Style-Printing with block, stencil, brush etc.
 - (b) Discharge Style-Pieces is dyed in one colour or shade. Discharge substances are printed. Discharges. Discharge by reducing agent.
 - (c) Resist style in this style portions of the fabric are resisted or covered by resisting substance which prevents the absorption of dye both at ordinary temperature.

Thickeners of thickening Agents

1. **Two classes** : Temporary Thickeners-Those which are used only as thickening agents and with are removed from fabric without affecting the colour.
2. **Permanent Thickeners**-Those which have a dual function of thickening and fixing and ultimately form the integral part of the colour.
Choice of thickening agents-starches-British Gum and Gum Traga Centre-Gum Arabic Protein thickening agents-Albumen both egg auzeochromes.
What are chromophores? What are auxochromes?
3. **Direct Style in detail** : General outlines, techniques of making wooden blocks. Preparation and application of wooden blocks-application of dye paste in the fabric-Kalam Kari Work and Fabric Painting. Stencil Cutting.
4. **Screen Printing** : Preparation of printing table. Preparation of Screens Arrangements for screen printing-method.
5. **Spary Printing** : Rooler Printing-Single Colour Rooler Printing Machine. Multi-colour Printing Machinery (Rooler)
6. **Merits and demerits of cylinder printing machine, Modification of the cylinder printing machines**-Surface Printing machine.

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Penotine printing machine-Advantages and penotine printing machine. Faults in roller printing, Causes of the faults in roller printing. Nature of faults.

PRACTICAL:

Block Printing:

- (1) Printing with various direct colours-with various shades.
- (2) Printing of wool and silk with acid colours with various shades.
- (3) Printing with basic colour.
- (4) Printing with Breutogen and Breutamine fast colours.
- (5) Ahiline black.
- (6) White discharge on direct colours.
- (7) Yellow discharge on direct colours.
- (8) Resist under Brenthols.

Stencils and Screen Printing :

1. Preparation of stencils spraying bring solution into a spray gun.
2. Preparation of screens. Printing with screens-Batick and tie and dye.

Dyeing Syllabus

Theory : What is dyeing ?

Invention of Parins manveby W.G. Parking in the year 1856.

What is true dyeing ?

Classification of dyes-Classification according to dyeing mechanism.

What are chromophores? What are auxo chromes?

Dyeing Process

- (1) Direct dyeing
- (2) Dyeing with reduced colour solution
- (3) Producing colours Fibres
- (4) Mordanting & dyeing

Special Dyeing Process :

- (1) Cuprous coir method
- (2) Pad steam process

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Syllabus : B.Sc. Part-III

- (3) Unbridge or submarine system
- (4) Williams hot air process
- (5) Standfast or mortar metal process
- (6) Teomosol Process.

Reactive Dyes

1. Procion dyes cotton : introduction-preparation of yarn for the dyeing scouring-bleaching Pretreatment with caustic soda.
2. Properties of Procion dyes : (Procion M and Procion H) Dyeing procedure in general salt soda additions for procian M dyes.
3. Dyeing procedure for procian H Dyes : Salt : soda ash additions for procian H Dyeing.
4. The substantive or direct dyestuffs-Properties Bleeding, topping, (Combination with basic dyestuffs to form less soluble compounds) theory of Dyeing with direct dyes. Application of Direct Dyestuffs to cotton General methods of Dyeing.
5. Acid Dyestuffs—Types of acid colour-General properties of Acid Dyestuff-Functions of Acid on wool. Application of Acid dyes in wool-preparation of woollen goods. Dissolving of acid dyes. Preparation of dyebath for Arid Colours General method for dyeing with Arid Colours. Effect of temperature.

Basic Dyes :

1. Introduction—Properties of basic dyes-Dissolving of basic dyes Assistants General method of dyeing silk with basic colours-Dyeing basic colour with natural soap.
2. Dispersed Dyestuff : (introduction) Application of dispersed dyestuffs for dyeing robbin dyeing machine-Cheese dyeing Machine.
3. Fabric dyeing machine—Dyeing Which and Dyeing Jigger.
Pattern dyeing and dyeing of mixed Fibres.
4. Cotton and wool : Dyeing with Nanus dyestuffs.
5. Cotton and silk : Dyeing both fibres with the same.
6. Silk and wool : Dyeing silk and wool.

Dyeing Practical :

1. It Dyeing of cotton yarn and fabric with direct colour to different shades say 0.5%, 1.0% upto 5% To have light

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2. Diagonising of Dyestuffs : (Ciphany) and Diagonpheny fast dye-stuffs Diagonising Developing.
3. Eclipse dyestuffs : (Sulphur colours)
Dissolving of eclipse dyestuffs. Dyening with eclipse dyestuffs.

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14. Bio Technology

B.Sc. Part III

Paper – I : Animal Cell Biotechnology & Environmental Biotechnology

Max. Marks-50

Section – A

General metabolism

Special secondary metabolites/products (Insulin, Growth hormone, Interferon, plasminogen activator, factor VIII etc.)

Expressing cloned proteins in animal cells. Over production and processing of chosen protein.

The need to express in animal cells

Production of vaccines in animal cells

Production of monoclonal antibodies

Growth factors promoting proliferation of animal cells (EGF, FGF, PDGF, IL-1 IL-2, NGF, erythropietin etc.)

Bioreactors for large-scale culture of cells.

Transplanting cultures cells.

Section – B

Renewable and no-renewable resources

What is renewable should be bioassimilable/biodegradable

Major consumer items: Food, fuel and fibres

Conventional fuels and their environmental impacts;

- Firewood
- Coal
- Animal oils
- Plant and animal
- Gas

Modern fuels and their environmental impacts:

- Methogenic bacteria and biogas
- Microbial hydrogen production
- Conversion of sugars to ethanol. The gasohol experiment.
- Solar energy converters—Hopes from the photosynthetic pigments

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Syllabus : B.Sc. Part-III

- Plant based petroleum industry?
- Cellulose degradation for combustible fuel

Section – C

Biotechnological inputs in producing good quality natural fibres
Transgenic sheep and transgenic plants
Microbiological quality of food and water
Treatment of municipal waste and industries effluents
Degradation of pesticides and other toxic chemicals by microorganisms
Thuringiensis toxin as a natural pesticide
Biological control of other insects swarming the agricultural fields
Enrichment of ores by microorganisms
Biofertilizers, Nitrogen fixing microorganisms enrich the soil with assimilable nitrogen.

B.Sc. Part III

Paper—II : Plant Biotechnology

Max.Marks—50

Section—A

Introduction to in vitro methods. Terms and definitions. Use of growth regulators.
Beginning in vitro cultures in our country (Over and ovule culture, in vitro pollination and fertilization.
Embryo culture, embryo rescue after wide hybridization and its applications
Introduction to the processes of embryogenesis and organogenesis and their practical applications.
Clonal multiplication of lite species (Micropropagation) exillary bud, shoot-tip and meristem culture.

Section –B

Haploids and their applications, Somaclonal variations and applications (Treasure your exceptions).
Endosperm culture and production of triploids.
Practical applications of tissue and organ culture (summarizing the practical applications of all above mentioned techniques).
Single-cell suspension cultures and their applications in selec-

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tion of variants/mutants with or without mutagen treatment (of haploid culture preferably).
Introduction to protoplast isolation: Principles and applications.
Testing of viability of isolated protoplasts.
Various steps in the regeneration of protoplasts.
Somatic hybridization-an introduction.

Section -C

Various methods for fusing protoplasts. Chemical, electrical.
Use of markers for selection of hybrid cells.
Practical applications of somatic hybridization (hybrids vs cybrids)
Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants. Introduction to A. tumefaciens.
Tumor formation on plants using A. tumefaciens (Monocots vs Dicots).
Root-formation using A. rhizogenes.
Practical application of genetic transformation.
Practical-Based on theory syllabus **Max.Marks-50**

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15. Garment Production and Export Management

B.Sc.-III		1	Apparel Production	2	50	18	3
Theory		2	International marketing	3	50	18	3
Practical		1	Clothing construction-3	4	25	09	4
		2	Dyeing and printing	3	25	09	4

B.Sc. : Part III

PAPER I : APPAREL, PRODUCTION

B.Sc. M.M. 50

Hrs. 3

Section A : Merchandising Theory

1. Introduction to fashion merchandising
2. Visual Merchandising.
3. Careers in the Apparel Industry

Section B : Manufacturing Technology

1. Product Development, Design Development, Developing a sample garment.
2. Apparel Production : Costing a garment purchasing, pattern making, production scheduling, spreading and cutting producers, contracting, garment assembly, finishing, quality control & labeling.
3. Introduction to industrial machines:
 - (a) Cutting-Round, straight and bank knife.
 - (b) Fusing-Collars, facings
 - (c) Sewing-Chain stitch, lock stitch, over lock, button hole, button sewing & blind stitching machine.

Section C : Textile Testing

1. Definition & objectives of testing
2. Sampling
3. Fabric Properties : Thread count, handle & drape, pilling, strength, tensile strength, tearing strength, grain line, dimensional stability.

Reference :

1. Both, Principles of Textile Testing, CBS Publishers & Distributors, New Delhi.
2. Skindle John H: Textile Testing, Chemical Publishing Co. Inc., Brooklyn, New York.
3. Frings StephensJim, Fashion : from concept to consumer, Prentice hall, inc.

B.Sc. Part III

PAPER II: INTERNATIONAL MARKETING

B.Sc. M.M. 50

Hrs. 3

Section A:

1. Identification of markets for ready made garments, size of the markets, marketing entry conditions, sources of information, sale of approval, export order.
2. Market entry and channels of distribution direct and indirect export, role of trading and export houses.

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Section B:

3. Product planning: formal wear casual wear, institutional segments, and packaging for export,
4. Quality control (An elementary knowledge)
5. Pricing : Role of price and non price factors, various elements of cost for export pricing, contract condition quotation, information needed for export pricing.
6. Selection of agent, agency agreements.

Section C:

7. Distributional logistics : transportation shipping Vs air, customs and excise formalities, pre-shipment inspect.
8. Export assistance measures.
9. Marketing plan.
10. India trade in readymade garments.
11. Trade fair and exhibition.

Reference :

Varshney Bhattacharya, International marketing management an Indian perspective.
M.J. Mathew, Management of marketing.
Suresh C.J. International marketing.
International marketing : Rathod & Kothari.

B.Sc. Part III PRACTICAL—1
Clothing Constructions—3

Hrs. 4

B.Sc. M.M.-25

1. Samples :

- (a) Placket Kurta
- (b) Pockets—Patch, Bound, Inseam, Kurta.
- (c) Seam finishes : lapped Seam, Top Seam
2. Drafting, cutting, stitching of following men's garment:
(d) Bengali kurta with Aligarhi Pyjama/kalidar kurta.
(e) Night suit
(f) Lehnga choli (lined blouse)

Reference :

Jindal, Ritu, handbook of fashion designing.

Kallal, Mary Jo, Construction.
Mitchell Beazley, The Sewing Book a complete practical guide.

B.Sc. Part III

PRACTICAL - II: DYEING AND PRINTING

B.Sc. M.M.-25

Hrs. 4

1. Dyeing : Tie and Dye and Batik
Use of various dyes on different fabrics.
2. Printing: Block and Screen printing.
Use of various printing paste on various fabrics.
3. Design development and adjustment for various types of fabric for Apparel and home furnishing with:
Natural, Stylized, Geometrical and Abstract Motifs.

References :

—Praying, Technology of Textile
—Shenai, Technologies of Dyeing.

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16 ~~16~~ : Geology and Mining — For Exam 2015

Scheme:

Theory: Max Marks 100 Minimum Pass marks: 36

Paper I: Mineral Resources — 3 hrs duration Max Marks 50

Paper II: Mineral Exploration & Mining Geology 3 hrs duration Max Marks 50

Practical (one) 4 hrs duration Max Marks 50

Paper I: Mineral Resources

Note: The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section –A

Economic Geology: Definition; Magma and its relationship with mineral deposits. Ore and gangue minerals. Processes of Mineral formation: Magmatic, Hydrothermal, Contact metasomatic, Evaporation, Oxidation and supergene enrichment, Sedimentation.

Section –B

Classification of mineral deposits: outline of Lindgren's and Bateman's classification, Important ores, Composition physical properties, mode of occurrence, association, origin, distribution in India & uses of the following metals: copper, lead, iron, manganese, and aluminum.

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Section -C

Important industrial minerals: Mode of occurrence, Physical properties, chemical composition and distribution in India-Refractory, Abrasives, Ceramics, cement and Fertilizers.

Coal, petroleum and radioactive minerals: their occurrences & distribution in India and origin.

Paper II: Mineral Exploration & Mining Geology

- Note: The paper will contain nine questions having three questions in each section. Candidates are required to attempt five questions in all, selecting at least one question from each section.

Section-A

Ore reserves and resources: definition and outline of classification of mineral reserves and resources. Methods of ore reserve estimation; concept of sampling, Assaying, bore hole drilling

Section-B

- Outline of geophysical and geochemical exploration. Explosives: types, storage and precautions in handling of explosives; blasting: various patterns of blast holes and methods of their charging and blasting.

Section-C

Elements of mining: Factors controlling selection of open cast and underground mining. Alluvial and opencast Mining methods. Underground mining methods

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with special referees to sub -level stoping Coal mining methods: room and pillar method, long wall method.

Practical

Systematic study, identification, description, mode of occurrence and uses of the following minerals: haematite, magnetite, limonite, siderite, pyrite, pyrrhotite, pyrolusite. Psilomelane, chromite, ilmenite, wolframite, chalcopyrite, cuprite, malachite, galena, sphalerite, magnesite, bauxite, realgar, orpiment, stibnite, cinnabar, asbestos, graphite and other important industrial minerals.

In an outline map of India plotting of occurrence of important ore minerals
Plane table and prismatic compass survey

Geological field work and collection of samples. Visit of at least one open cast mine.

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17 ECONOMICS

Scheme :	Min. Pass Marks	Max. Marks
Arts	72	200
Science	54	150
Paper-I	3 hours duration	Arts 100 Science 75
Paper-II	3 hours duration	Arts 100 Science 75

Note : 1. There shall be two papers in each class. Each paper shall have 3 questions from every unit. In Addition to these nine questions (3 questions for each unit) there shall be one multiple choice/objective type/ short answer question in each of the two papers

This question shall be compulsory.

2. The student shall be required to attempt five questions in all in each paper selecting atleast one question from each unit and one compulsory multiple choice/objective type/short answer question
3. The multiple choice/objective type/short answer question shall consist of 20 questions in B.A. Examination and 15 questions in B. Sc. examination of one mark each.

Alpans
Professor & Head
Department of Economics -
University of Rajasthan, Jaipur

SYLLABUS - B.A. /B. Sc. (Pass) Part III. For 2014 Exam

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Paper - (I) Introduction to International Trade, Development and Public Economics**Section - A**

Features of International Trade. Gains from Trade. Trade Theories - Adam Smith, Ricardo, Haberler, Mill and H- O Theory (Elementary Treatment). Free Trade and Protection. Foreign Exchange Market and Exchange rate. Balance of Trade and Balance of Payment - Definition and Structure. WTO - Scope and Impact.

Section B

Economic Growth and Development - Factor Affecting Economic Growth. Development and Underdevelopment. Measures of Development. Lewis Theory of Unlimited Supply of Labour. Balanced V/S Unbalanced Growth Model. Harrod - Domar & Solow's Model. Concept of Poverty and Inequality.

Section - C

Nature and Scope of Public Finance. Role of Government in the Economy. Optimal Budgeting. Public goods and Private goods. Public Revenue - Canons of Taxation. Incidence, Impact and Shifting of Taxation. Direct and Indirect Taxation. Public Expenditure - Canons of Public Expenditure, Classification and Effect on Production and on Distribution. Public Debt - Meaning, Objectives, Burden and Theories of Public Debt. Fiscal Policy - Meaning, Objectives and Anti inflationary Policy.

Books Recommended:

1. R. A. Musgrave and P. B. Musgrave, Public Finance in Theory & Practice, McGraw Hill Publication.
2. S. Ganguli, Public Finance, The World Press Pvt. Ltd.
3. H. L. Bhatia, Public Finance, Vikas Publishing House Pvt. Ltd.
4. John Callis and Philip Jones, Public Finance and Public Choice, Oxford University Press.
5. D. Salvatore : International Economics, John Wiley and Sons.
6. K. C. Rana and K. N. Verma : International Economics. (Hindi/English edition) Vishal Publishing Company, Delhi.
7. B. O. Soderston & G. Reed: International Economics, Palgrave Macmillan.
8. Michael P. Todaro, Economic Development, Pearson Education.
9. A. P. Thirwal, Growth and Development, Macmillan.
10. Debraj Raj, Development Economics, Oxford University Press.
11. S. K. Mishra and V. K. Puri, Economics of Development and Planning - Theory and Practice, Himalaya Publishing House.

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B.A./ B.Sc. Part-III

Paper –II (a): Applications of Mathematics in Economics

Section-A

Differential Calculus and Integral Calculus: Applications in Economics; Matrix and Determinants; Solution of Simultaneous Equations; Maxima and Minima; Convexity and Concavity.

Theory of Consumer Behaviour: Nature of a Utility Function; Properties of an Indifference Curve, Maximization of Utility. Demand Functions- Ordinary and Compensated, Price and Income Elasticity, Elasticity Relations in Demand Analysis, Slutsky Equation in two Commodity Case, Elasticity Form and Important Results; Income and Leisure - Derivation of Labour Supply Function and its Properties.

Section –B

Theory of Firm: Production Function- Properties of a Well Behaved and Homogeneous Production Functions -Cobb-Douglas and CES Production Functions; Product Curves; Output Elasticity of Factor Input; Properties of an Isoquant; Elasticity of Substitution of a Homogeneous Production Function- Linearly Homogeneous and Cobb-Douglas Production Functions; Optimization Behaviour of a Firm- Constrained Cost Minimization, Constrained Output Maximization and Profit Maximization; Input Demand Functions- Properties and Derivation of Producer's Input Demand functions; Cost Functions- Properties and Derivation of Short Run and Long Run Cost functions; Consumer's and Producer's Surplus.

Section-C

Linear Programming: Graphical and Simplex Method (Maximization Problem Only); Input-Output Analysis: Concepts of Static, Dynamic, Closed and Open Input - Output Models, Hawkins-Simon Conditions of Viability, Determination of Gross Output, and Value Added in Open Input –Output Model; Theory of Games: Two-Person Constant Sum Games, Zero-Sum Game, Maximin and Minimax, Dominant Strategies and Saddle Point Solution; First Order Difference Equation- Cobweb Model.

Note: Use of Non-Programmable Calculator is Permitted.

Books Recommended:

1. J.M. Henderson and R.L. Quandt: Micro Economic Theory: A Mathematical Approach, McGraw-Hill. London.
2. RGD Allen, Mathematical Economics, McMillan
3. B.C. Mehta: Mathematical Economics: Micro Economic Models, Sultan Chand & Sons, New Delhi.
4. Alpha C Chiang: Fundamental Methods of Mathematical Economics, McGraw-Hill, Kagakusha, Tokyo.

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B.A./B.Sc. Part-III: Economics

Paper – II (b) Environmental Economics

Section – A

Environmental Economics: Meaning, Nature, Scope and Significance; Economic Development and the Environment; Common Property Resources and their Depletion, Ecosystems – Loss of Biodiversity; Sustainable Development; Environmental Problems of Industrial Development: Water Pollution, Air Pollution, Noise Pollution ; Depletion of Ozone Layer- Carbon Credit; Environmental Problems of Agricultural Development- Salinity, Water Logging, Desertification of Land ; Excess Use of Water, Fertilizers and Pesticides, Farm Implements Cropping Pattern; Natural Farming; Forest Depletion: Causes and Impact.

Section-B

Role of Various Sectors in Environment Protection: Role of Public / Government, Private, Co-operative Sectors and NGOs in Environment Protection; Environmental Policy in India: Environment Protection Laws in India, Central pollution Control Board, State Pollution Control Boards, Local Bodies and Environment Protection.

Section-C

Global Environmental Issues: WTO and Environment, Trade and Environment- Climate Change, Natural Resource Accounting, International Attempts to Protect the Environment: Movements, Laws, and Agreements.

Books Recommended:

1. Bhattacharya R.N. (Ed) (2001), Environmental Economics: An Indian Perspective, Oxford University Press, New Delhi.
2. U.Shankar (Ed)(2001), Environmental Economics , Oxford University Press, New Delhi.
3. Baumal, W. J. & W. E. (1997), The Theory of Environmental Policy, Prentice Hall, Englewood-Cliffs.
4. Dorfman, R. & N. Dorfman (Eds.) (1977), Economics of the Environment, W W. Norton, New York.
5. Nijkamp, P. (Ed.) (1976), Environmental Economics, Vol. I & II, Martinus Nijhoff, Leiden
6. Charles Perring (1987), Economy and Environment Cambridge University Press, New York.
7. Karpagam, M. (1993), Environmental Economics, Sterling Publishers, New Delhi.

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