UNIVERSITY OF RAJASTHAN
JAIPUR

SYLLABUS

B.Sc. Part-II

EXAMINATIONS – 2018
SCHEME OF EXAMINATION

B.Sc. (Pass Course) Part-II

The number of paper and the maximum marks for each paper together with the minimum marks required for a pass are shown in the scheme of examination against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper, wherever prescribed, separately. Classification of successful candidates shall be as follows:

- First Division 60%
- Second Division 48%

of the aggregate marks prescribed at (a) Part First Examination excluding those obtained in the compulsory subject (b) Part Second Examination (c) Part Third Examination taken together.

All the rest will be declared to have passed the examination, if they obtain a minimum pass mark in each subject viz. 36%. No division shall be awarded at the Part First and Part Second Examinations.
CONTENTS

Scheme of Examination

SYLLABUS
1. Physics
2. Chemistry
3. Zoology
4. Botany
5. Geology
6. Mathematics
7. Economics
8. Geography
9. Statistics
10. Applied Statistics
11. Psychology
12. Textile Craft
13. Bio-Technology
14. Garment Production and Export Management
15. Geology and Mining
16. Environmental Science
17. Computer Application
18. Electronics
### Scheme:

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Max. Marks: 100</th>
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<tbody>
<tr>
<td>Min. Pass Marks</td>
<td>36</td>
</tr>
<tr>
<td>Paper I</td>
<td>3 hrs. duration</td>
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<tr>
<td>Paper II</td>
<td>3 hrs. duration</td>
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<tr>
<td>Paper III</td>
<td>3 hrs. duration</td>
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<tr>
<td>Practical</td>
<td>5 hrs. duration</td>
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</table>

**Paper-I**: Thermodynamics and Statistical Physics

**Work Load**: 2 hrs. Lecture/week

**Examination Duration**: 3 Hrs.

**Scheme of Examination**: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

#### Unit-1

**Thermal and adiabatic interactions**: Thermal interaction; Zeroth law of thermodynamics; System in thermal contact with a heat reservoir (canonical distribution); Energy fluctuations; Entropy of a system in a heat bath; Helmholtz free energy; Adiabatic interaction and enthalpy; General interaction and first law of thermodynamics; Infinitesimal general interaction; Gibbs free energy; Phase transitions; Clausius Clapeyron equation; Vapour pressure curve; Heat engine and efficiency of engine; Carnot's Cycle; Thermodynamic scale as an absolute scale; Maxwell relations and their applications.

#### Unit-2

**Production of law temperatures and applications**: Joule Thompson expansion and J T coefficients for ideal as well as Vander Waal's gas, porous plug experiment, temperature inversion. Regenerative cooling. Cooling by adiabatic expansion and demagnetization; Liquid Helium He I and He II, superfluidity. Refrigeration through Helium dilution; Quest for absolute zero. Nernst heat theorem.

**The distribution of molecular velocities**: Distribution law of molecular velocities, most probable, average and r.m.s. velocities. Energy distribution function: effusion and molecular beam. Experimental verification of the Maxwell velocity distribution; The principle of equipartition of energy.

**Transport phenomena**: Mean free path, distribution of free paths, coefficients of viscosity, thermal conductivity, diffusion and their interaction.

#### Unit-3


#### Unit-4


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probability; Bose-Einstein statistics and its distribution function; Planck distribution function and radiation formula; Fermi-Dirac statistics and its distribution function, contact potential, thermionic emission; Specific heat anomaly of metals; Nuclear spin statistics (para- and ortho-hydrogen).

**Paper- II: Mathematical Physics and Special Theory of Relativity**

**Work Load:** 2 hrs. lecture /week

**Examination Duration:** 3 Hrs.

**Scheme of Examination:** First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

**UNIT-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, contra-variant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors.
Dirac delta function and its properties.

**UNIT-2**

Lorentz transformation and rotation in space-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.
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.

**UNIT-3**

(A) Transformation of electric and magnetic fields between two inertial frames.
(B) 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 like orthogonality, recurrence relation, graphical representation and generating function of Hermite, Lagendre, Laguerre and Associated Legendre function (simple applications)

**UNIT-4**

Techniques of separation of variables and its application to following boundary value problems
(1) Laplace equation in three dimensional Cartesian coordinate system, line charge between two infinite parallel plane (2) Helmholtz equation in circular cylindrical coordinates-cylindrical resonant cavity (3) Wave equation in spherical polar coordinate, the vibrations of a circular membrane. (4) D'Alembert 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.

**Paper III: Electronics and Solid State Devices**

**Work Load:** 2 hrs. lecture /week

**Examination Duration:** 3 Hrs.

**Scheme of Examination:** First question will be of ten marks comprising of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

**Unit 1: Circuit analysis and PN junctions**

Circuit analysis: Networks- some important definitions, loop and nodal equation based on D.C. and A.C. circuits (Kirchhoffs Laws). Four terminal network: Ampere volt conventions, open, close and hybrid parameters of any four terminal network, input, output and mutual impedance for an active four terminal network. Various circuit theorems: Superposition, Thevenin, Norton, reciprocity, compensation, maximum power transfer and Miller theorems. PN junction: Charge densities in N and P materials; Conduction by drift and diffusion of charge carriers, PN diode equation; capacitance effects.

**Unit 2: Rectifiers and transistors**

Rectifiers: Half-wave, full wave and bridge rectifier; calculation of ripple factor, efficiency and regulation; Filters: series inductor, shunt capacitor, L section and π-section filters. Voltage regulation: Voltage regulation and voltage stabilization by Zener diode, voltage multiplier. Transistors: Notations and volt-ampere characteristics for bipolar Junctions transistor. Concept of load line and operating point Hybrid parameters. CB, CE, CC configurations. Junction field effect transistor (JFET) and metal oxide semiconductor filed effect transistor (MOSFET). Circuit symbols, biasing and volt-ampere characteristics, source follower operation of FET as variable voltage resister.

**Unit 3: Transistor biasing and amplifiers**

Transistor biasing: Need of bias and stability of Q point, stability factors, and various types of bias circuits for thermal bias stability, fixed bias, collector to base feedback bias and four resistor bias. Amplifiers: Analysis of transistor amplifiers using hybrid parameters and its gain-frequency response. Cascade amplifiers, basic idea of direct coupled and R.C coupled amplifiers, Differential amplifiers, Amplifier with feedback, Concept of feedback, positive and negative feedback, voltage and current feedback circuits. Advantage of negative feedback: Stabilization of gain, effect of negative feedback on output and input resistance, reduction of nonlinear distortion, effect on gain - frequency response.

**Unit 4: Oscillators and Logic Circuits**


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Logic circuits: Logic fundamentals: AND, OR, NOT, NOR, NAND, XOR gates, Boolean algebra. De Morgan's theorem, positive and negative logic, logic gates circuit realization using DTL and TTL logic, simplification of Boolean expressions.

Reference Books:


PRACTICAL

Teaching: 4 hrs/week
Practical One-Paper: 3 hrs. duration
Min Pass Marks: 18
Max. Marks: 50

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

Section-A
1. Study of dependence of velocity of wave propagation on linear parameter using torsional wave apparatus.
2. Study of variation of reflection coefficient of nature of termination using torsional wave apparatus.
3. Using platinum resistance thermometer find the melting point of a given substance.
4. Using Newton’s rings method find out the wave length of a monochromatic source and find the refractive index of liquid.
5. Using Michelson’s interferometer find out the wavelength of given monochromatic source (Sodium Light)
6. To determine dispersive power of prism.
7. To determine wave length of sodium light using grating.
8. To determine wave length of sodium light using Bipsin.
9. Determine the thermodynamic constant \( r = \frac{C_p}{C_v} \) using Clement’s & Desorme’s method.
10. To determine thermal conductivity of a bad conductor by Lee’s method.
11. Determination of ballistic constant of a ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature.

Section-B
1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath).
2. Study of power supply using two diodes/bridge rectifier with various filter circuits.

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3. Study of half wave rectifier using single diode and application of L and π section filters.

4. To study characteristics of a given transistor PNP/NPN (common emitter, common base and common collector configurations).

5. Determination of band gap using a junction diode.

6. Determination of power factor (cos θ) of a given coil using CRO.

7. Study of single stage transistor audio amplifier (variation of gain with frequency).

8. To determine e/m by Thomson's method.

9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.


11. Measurement of capacitance and dielectric constant of a liquid and gang condensor by de-Sauty bridge.

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2. CHEMISTRY

Scheme:
Max Marks: 150

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<th>Duration (hrs.)</th>
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<th>Min. Pass Marks</th>
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<tbody>
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<td>Paper-I</td>
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<tr>
<td>Paper-II</td>
<td>3</td>
<td>33</td>
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<tr>
<td>Paper-III</td>
<td>3</td>
<td>34</td>
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<tr>
<td>Practical</td>
<td>5</td>
<td>50</td>
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</tbody>
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Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

CH-201 Paper-I: Inorganic Chemistry
(2 hrs or 3 periods/week)

Unit-I

Chemistry of Elements of First Transition Series:
Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation-states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment with their 3d-analouges in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Unit-II

Coordination Compounds:
Werner’s coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit-III

Chemistry of Lanthanide and Actinide Elements:
Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds. General features, chemistry of separation of Sp, Pu and Am from U, electronic configuration, oxidation states, magnetic properties, complexation behavior, comparison of lanthanides and actinides, super heavy elements.

Unit-IV

Oxidation and Reduction:
Unit-V

Acids and Bases:

Non-aqueous Solvents:
Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂.

CH-202 Paper-II: Organic Chemistry
(2 Hrs. or 3 periods/week)

Unit-I

Electromagnetic Spectrum: An Introduction

Absorption Spectroscopy
Ultraviolet (UV) spectroscopy - Absorption laws (Beer-Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of solvents on transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.

Infrared (IR) spectroscopy - Molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristics absorption of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II

Alcohols - Classification and nomenclature
Dihydric alcohols - methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)₄ and HIO₄] and pinacol-pinacolone rearrangement.
Trihydric alcohols - methods of formation, chemical reactions of glycerol.

Phenols

Ethers and Epoxides
Methods of formation, physical properties. Chemical reactions - cleavage and autoxidation, Ziese's method.
Synthesis of epoxides: Acid and base catalyzed ring opening of epoxides, orientation of epoxide.
ring opening, reactions of Grignard and organolithium reagents with epoxides.

**Unit-III**

**Aldehydes and Ketones**
Structure of the carbonyl group. Syntheses of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, syntheses of ketones from nitriles and from carboxylic acids. Physical properties.

**Unit-IV**

**Carboxylic Acids**
Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids.
Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

**Carboxylic Acid Derivatives**
Structure, nomenclature and synthesis of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.
Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic).

**Unit-V**

**Organic Compounds of Nitrogen**
Amines: Structure, nomenclature and preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Gabriel-phtalimide reaction and Hoffmann bromamide reaction with mechanism.
Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Diazotisation and mechanism. Synthetic transformations of aryl diazonium salts, azo coupling and its applications.
UNIT-I

Thermodynamics - I
Definition of Thermodynamic Terms: System, surroundings, etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process, concept of heat and work.
First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, heat capacity, heat capacities at constant volume and pressure and their relationship. Joule’s law, Joule-Thomson coefficient and inversion temperature. Calculation of \( w, q, \Delta U \) and \( \Delta H \) for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

UNIT-II

Thermodynamics -II
Concept of Entropy: Entropy as a state function, entropy as a function of V&T, entropy as a function of P&T, entropy change in physical change, Clausius inequality and entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions. Gibbs function (\( G \)) and Helmholtz function (\( A \)) as thermodynamic quantities. \( A \) & \( G \) as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of \( G \) and \( A \) with \( P, V \) and \( T \).
Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action, Le Chatelier’s principle. Reaction Isotherm and reaction isochore. Clapeyron equation and Clapeyron-Clapeyron equation, applications.

UNIT-III

Phase Equilibrium: Statement and meaning of the terms phase, component and degree of freedom. Derivation of Gibbs phase rule. Phase equilibria of one component system - water, CO\(_2\) and sulphur systems.
Phase equilibria of two component system: solid-liquid equilibria simple eutectic Bi-Cd, Pb-Ag systems, desilverization of lead.
Solid solutions: Compound formation with Congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H\(_2\)O) System Freezing mixtures acetone-dry ice.

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UNIT-IV

Electrochemistry – I
Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law, its uses and limitations. Debye-Huckel-Onsager’s equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf’s method and moving boundary method. Applications of conductivity measurements: Determination of degree of dissociation, determination of $K_a$ of acids, determination of solubility product of a sparingly soluble salt. Conductometric titrations.

UNIT-V

Electrochemistry – II

Suggested Books:
3. A Text Book of Physical Chemistry: Kundu and Jain.

CH-204 Chemistry Practical (Pass course), Laboratory Course-II
(4 hrs or 6 periods / week)

Inorganic Chemistry
(i) Preparation of Standard Solutions
   Dilution - 0.1 M to 0.001 M solutions
(ii) Volumetric Analysis
   (a) Determination of acetic acid in commercial vinegar using NaOH
   (b) Determination of alkali content in medicinal tablet using HCl
   (c) Estimation of calcium content in chalk, calcium oxalate by permanganometer

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(d) Estimation of hardness of water by EDTA
(e) Estimation of ferrous and ferric by dichromate method
(f) Estimation of copper using thiosulphate

(iii) Gravimetric Analysis
(a) Cu as CuSCN
(b) Ni as Ni (dimethylglyoxime)

Organic Chemistry
(i) Laboratory Techniques
A. Thin Layer Chromatography
   Determination of Rf values and identification of organic compounds.
   (a) Separation of green leaf pigments (spinach leaves may be used).
   (b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone,
       hexan-2-one and hexan-3-one using toluene and light petroleum (40-60) solvent system.
   (c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5 : 1.5)

B. Paper Chromatography: Ascending and Circular
   Determination of Rf values and identification of organic compounds.
   (a) Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid,
       leucine and glutamic acid. Spray reagent – ninhydrin.
   (b) Separation of a mixture of DL – alanine, glycine and L-Leucine using n-butanol:
       acetic acid: water (4:1:5), Spray reagent-ninhydrin.
   (c) Separation of monosaccharides a mixture of D-galactose and D-Fructose Using

(ii) Qualitative Analysis
   Identification of two organic compounds (one solid and one liquid) through the functional group analysis, determination of melting point, boiling point and preparation of suitable derivatives.

Physical Chemistry
(i) Transition Temperature
   a) Determination of the transition temperature of the given substance by thermometric/
      dialometric method (e.g. MnCl3.4H2O / SrBr3.2H2O).

(ii) Thermochemistry
   a) To determine the solubility of benzoic acid at different temperatures and to determine
      \( \Delta H \) of the dissolution process.
   b) To determine the enthalpy of neutralization of a weak acid/ weak base versus strong
      base/ strong acid and determine the enthalpy of ionization of the weak acid / weak
      base.
   c) To determine the enthalpy of solution of solid calcium chloride and calculate the
      lattice energy of calcium chloride from its enthalpy data using Born-Haber cycle.

(iii) Phase Equilibrium
   a) To study the effect of a solute (e.g. NaCl, sucrose) on the critical solution temperature
      of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration
      of that solute in the given phenol-water system.
(iv) Distribution law
   a) To study the distribution of iodine between water and CCl₄.
   b) To study the distribution of benzoic acid between benzene and water.

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(Instructions to the Examiner)
B.Sc. Part II
CH- 204 Chemistry Practical (Pass course)

Max. Marks: 50  
Duration of Exam: 5 hrs.  
Minimum Pass Marks: 18

Inorganic Chemistry
Ex. 1 Volumetric Analysis
or
Gravimetric Analysis as mentioned in the syllabus  

Organic Chemistry
Ex. 2 Identification of two organic compounds (one solid and one liquid) through the functional group analysis, determination of melting point, boiling point and preparation of suitable derivatives.
or
Perform one experiment out of the experiments on thin layer and paper chromatography given in syllabus.

Physical Chemistry
Ex. 3 Perform one of the physical chemistry experiments as mentioned in the syllabus.

Ex. 4 Viva-voce  
Ex. 5 Record  

Books Suggested (Theory Course)
2. Concise Inorganic Chemistry, J.D. Lee, FLBS
6. Inorganic Chemistry, A.G. Sharpe, FLBS

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Books Suggested (Laboratory Courses)
1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.
Zoology

Scheme:
Max. Marks: 100

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<th>Paper I</th>
<th>: 3 Hrs duration</th>
<th>33 Marks</th>
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</table>

NOTE:
1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.
   Second part of 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 4 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-201
STRUCTURE AND FUNCTION OF INVERTEBRATE TYPES

Section – A

Structure and Function-I
Structural and functional organization of vital systems of non-chordates as exemplified by
Amoeba, Paramecium, Euglena, Obelia, Sycon, Fasciola, Taenia, Nereis, Hirudinaria, Palaemon, Lamellidens, Pila and Aseterias.

1. Locomotion: Pseudopodial (Amoeba), ciliary (Paramecium), flagellar (Euglena), parapodial (Nereis), pedal-muscular foot (Pila) and tube-feet (Asterias).
2. Skeleton: Endoskeleton (spicules of Sycon); exoskeleton, chitinous (Palaemon), calcareous (Corals, Pila, Lamellidens and Asterias), siliceous (Radiolaria).
3. Nervous System: Sensory and nerve cells (Obelia); brain ring and longitudinal nerves (Fasciola and Taenia); brain and ventral nerve cord (Nereis and Palaemon); nervous system of Pila and Lamellidens.
4. Sense-organs: Statocyst and osphradium (Lamellidens and Pila), compound eye (Palaemon) and simple eye (Nereis, Pila); tactile and olfactory organs (Palaemon); nuchal organs (Nereis).

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Section - B

Structure and Function-II

1. Food, feeding, digestive structures and digestion: Autotrophic (Euglena); heterotrophic through food vacuole (Paramecium) and in hydroid and medusoid zooids (Obelia); Parastitic (Fasciola, Taenia, Hirudinaria); predatory (Nereis, Palaemon, Asterias); filter-feeding (Lamellidens).

2. Respiration: Aquatic general body surface (Euglena, Nereis, Hirudinaria); dermal bronchial (Asterias) parapodia (Nereis), gills (Palaemon, Lemellidens, Pila); aerial: pulmonary sac (Pila), trachea (insect); anaerobic (Fasciola, Taenia).

3. Excretion: General body surface (Protozoa, Sycon, Obelia); protonephridial system and flame cells (Fasciola, Taenia); nephridia (Nereis, Hirudinaria); malpighian tubules (Insect); organ of Bojanus (Lamellidens, Pila).

4. Circulation: Cycrosis (Euglena, Paramecium); diffusion (Sycon, Obelia, Fasciola, Taenia); open circulatory system (Hirudinaria, Palaemon, Lamellidens, Pila, Asterias); closed circulatory system (Nereis).

5. Reproduction: Asexual (Paramecium, Euglena, Sycon); alternation of generation (Obelia); sexual (Fasciola, Taenia, Nereis, Lamellidens, Pila, Hirudinaria, Asterias).

Section - C

Invertebrate Adaptations

1. Salient features of Hemichordata.
2. Evolution of canal system of sponges.
3. Parasitic adaptations in Helminthes.
4. Social organization in termites and honey bees.
5. Direct and indirect development in insects.
7. Crustacean larvae.

PAPER – II: Z-202
ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

Section – A

Animal Physiology with special reference to mammals

1. Osmoregulation in mammals.
2. Physiology of digestion: Various types of digestive enzymes and their digestive action in the alimentary canal.
3. Physiology of blood circulation: Composition and functions of blood; mechanism of blood clotting; heart beat; cardiac cycle; blood pressure; body temperature regulation.
4. Physiology of respiration: Mechanism of breathing; exchange of gases: transportation of oxygen and carbon dioxide in blood; regulation of respiration.
5. Physiology of excretion: Kinds of nitrogenous excretory end products (ammonotelic, uricotelic and ureotelic); role of liver in the formation of these end products. Functional architecture of mammalian kidney tubule and formation of urine; hormonal regulation of water and electrolyte balance (Homeostasis).
Section - B
Regulatory aspects of Animal Physiology
1. Physiology of nerve impulse and reflex action: functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission, reflex arc.
2. Physiology of muscle contraction: Functional architecture of skeletal muscles; chemical and biophysical events during contraction and relaxation of muscle fibers.
3. Types of endocrine glands, their secretions and functions: Pituitary, adrenal, thyroid, islets of Langerhan's, testis and ovary.
5. Preliminary idea of neurosecretion, hypothalamic control of pituitary function.

Section - C
Biochemistry
1. Carbohydrates: Structure, function and significance; oxidation of glucose through glycolysis, Kreb's cycle and oxidative phosphorylation; elementary knowledge of interconversion of glycogen and glucose in liver; role of insulin and glucagon.
3. Enzymes: Types and mechanism of action.
4. Lipids: Structure, function and significance; Beta-oxidative pathway of fatty acids; brief account of biosynthesis of triglycerides. Cholesterol and its metabolism.
5. Catabolism and biosynthesis of nucleotides.

Paper – III: Z-203
Immunology, Microbiology & Biotechnology

Section - A
Immunology
1. Immunology: Definition, types of immunity: innate and acquired; humoral and cell mediated. Organs of immune system.
2. Antigen and antibody: Antigenicity of molecules, happens, antibody types.
3. Antigen-Antibody reactions: Precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.
4. Immunity Regulating Cells: Macrophages, lymphocytes (B and T-Types) T-helper cells, T-Killer cells, plasma cells and memory cells.
5. Mechanism of humoral or antibody mediated immunity and cell mediated immunity.
6. MHC: Structure and function of class I, II and III MHC molecules, regulation of MHC expression.

Section - B
Microbiology
2. The Prokaryota (Bacteria) : Structural organization:
   (i) Size, shapes and patterns of arrangement.
(ii) Structural organization: Slime layer (capsule), cell envelopes: cytoplasmic membrane (inner membrane). Cell wall (outer membrane) of Gram-negative and Gram-positive bacteria; mesosomes; cytoplasmic organization; cell projections: flagella and cilia.

3. Genetic material of Bacteria: Chromosome, replication of bacterial DNA.

4. Reproduction in Bacteria: Asexual reproduction, binary fission, budding, endospore formation, exospores and cyst formation; sexual reproduction, conjugation.

5. Microbial Nutrition: Culture of bacteria
   a. Carbon and energy source
   b. Nitrogen and minerals
   c. Organic growth factors
   d. Environmental factors: Temperature and pH

6. Bacteria of Medical Importance:
   (i) Gram-Positive
      a. Cocci: Staphylococi, Streptococci
      b. Bacilli: Diphtheria, Tetanus.
   (ii) Gram-Negative
      a. Cocci: Gonorrhea Meningitis
      b. Bacilli: Diarrhoea
   (iii) Mycobacteria: Tuberculosis, Leprosy

7. AIDS and hepatitis. The causative agents, transmission, pathogenicity, laboratory diagnosis, treatment and prevention (elementary idea only).

Section - C

Biotechnology
1. Definition, history, scope and application of biotechnology, major areas of biotechnology (microbial, plant and animal biotechnology).
2. Vectors for gene transfer.
3. Basic concepts of animal cell, tissue, organ and embryo culture.
4. Protoplast fusion in prokaryotes and eukaryotes.
5. Recombinant DNA technology; hybridomas and their applications, PCR. DNA fingerprinting, DNA foot printing. RFLP, RAPD & AFLP, Human genome project. Genomics & Proteomics (Brief idea only).
7. Genetic engineering (outline idea only): Applications of genetic engineering, hazards and regulations.
8. Transgenic animals, their uses.
10. Biotechnology in medicine (outline idea only), antibiotics, vaccines, enzymes, vitamins, hormones, artificial blood.
11. Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste water treatment.
12. Food, drink and dairy biotechnology (outline idea only): Fermented food production; dairy products, wine, beer, vinegar and food preservation.
Practical - Zoology

Min. Marks: 18  
4 Hrs. / Week  
Max. Marks: 50

I. Study of Museum Specimens:
   Platyhelminthes : Taenia
   Aschelminthes : Ascaris
   Annelida : Neanthes, Heteronereis, Aphrodite, Chaetopterus, Arenicola, Glossiphonia, Pontobdella, Polygordius.
   Onychophora : Peripatus
   Mollusca : Chiton, Aplysia, Cyprea, Mytilus, Pearl Oyster, Dentalium, Loligo, Nautilus.
   Echinodermata : Pentaceros, Echinus, Ophiithrix, Cucumaria, Antendon.
   Hemichordata : Balanoglossus.

II. Study of Microscopic Slides:
   Platyhelminthes : Planaria, Fasciola (WM), T. S. body of Fasciola, Miracidium, Sporocyst, Redia and Cercaria Larvae of Fasciola, Scolex, T. S. mature proglottid of Taenia, Cysticerus larva.
   Aschelminthes : Wuchereria, Dracunculus.
   Annelida : T.S. body of Nereis.

II. Study of the Following Through Permanent Slide Preparation:
   (i) Larval forms of liver fluke
   (ii) Differential staining-Blood smear (wrights or leishman stain.}

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IV. Anatomy:

*Prawns/Squilla* : External features, appendages, alimentary canal and nervous system; Hastate Plate

*Pila* : External, features pallial organs and nervous system; Osphradium, Radula.

V. Microbiology Immunology and Biotechnology:

1. Preparation and use of culture media for microbes.

2. Study of microbes in food materials like curd, etc (Lactobacillus Aspergillums, Mucor, Penicillium).

3. Educational tour to any Microbiology laboratory, Dairy, Food processing factory and Distillery for first hand study. Collection of material may also be encouraged wherever possible. Candidates are expected to submit a detailed report of such visit.

4. Antigen-antibody reactions-precipitation, agglutination

5. A brief practical idea of fermentation of food, food preservation.

VI. Animal Physiology:

1. Counting of red and white blood cells in the given blood sample.

2. Estimation of hemoglobin in the given blood sample.

3. Estimation of haematocrit value (PCV) in the given blood sample.

4. Demonstration of enzyme activity (catalase) in liver.

5. Study of salivary digestion of starch and the effect of heat and alcohol on salivary digestion of starch.


VII. Biochemistry:

1. Detection of protein, carbohydrate and lipid in the animal tissue/food samples.

2. Identification of different kinds of mono-, di- and poly-saccharides in the given food samples.


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**Scheme of Practical Examination Distribution of Marks**

<table>
<thead>
<tr>
<th>Time: 4 Hrs.</th>
<th>Min. Pass Marks.: 18</th>
<th>Max. Marks: 50</th>
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<tbody>
<tr>
<td></td>
<td>Regular</td>
<td>Ex. /N.C. Students</td>
</tr>
<tr>
<td>1. Anatomy (any system)</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Exercise in Microbiology/immunology/Biotechnology</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Exercise in Animal Physiology</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5. Exercise in Biochemistry</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6. Identification and comments on Spots (1 to 8)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>7. Viva Voce</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8. Class Record</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

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**Notes:**

1. With reference to anatomy (Dissection), study of prescribed types (charts/models) candidates must be well versed in the study of various systems. CD ROMs multimedia computer based simulations including computer assisted learning (CAL) and other soft wares may be used.

2. With reference to permanent preparations and microscopic slides, **the exercise should be substituted with diagrams, photographs, models, charts, etc.**

3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.

4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.

5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.

6. **It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.**

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Recommended Books:
17. Grant: Biology of Developmental System
Scheme

Min. Pass Marks: 56
Paper I 3 hrs. duration
Paper II 3 hrs. duration
Paper III 3 hrs. duration
Practical Min. Marks: 18 4 hrs. duration
Max Marks: 100
Max. Marks: 33
Max. Marks: 33
Max. Marks: 34
Max. Marks: 50
3 hours
4 hours

Duration of examination of each theory paper-
Duration of examination of practicals-

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.

2. Q No. 1 will have 18 very short answer type questions (not more than 20 words) of half marks each 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.
PAPER-I
Molecular Biology and Biotechnology
(Chris week)

Unit-1

Genetic Material: Biological, chemical and physical nature of heredity material. Structure of DNA and RNAs (mRNA, tRNA and rRNA). Watson and Crick model of DNA. Nucleosome model.

DNA Replication: Meselson – Stahl experiment of semiconservative replication of DNA; RNA Primers, Okazaki fragments, polymerases. DNA-Protein interactions.

Preliminary account of DNA damage and repair.

Unit-2

Central dogma of life. Transcription in eukaryotes: role of promoter, gene, pre mRNA synthesis, pre mRNA processing: capping, splicing and polyadenylation.

Translation: genetic code (codon), Initiation, elongation and termination.

Regulation of gene expression in prokaryotes and eukaryotes: Negative and positive control, attenuation and antitermination. Reverse transcriptase and its application.

Unit-3

Biotechnology: Functional definition. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency: Callusing, Differentiation and morphogenesis; Micropropagation; Tissue culture and its applications. Basic concept of Protoplast culture. Anther culture. Embryo culture and their applications.

Unit-4


Practical Exercises
1. Elementary knowledge of principles and uses of various instruments in molecular biology and proteinology. Laminar air flow, Centrifuge, Autoclave, Incubator, Spectrophotometer, Electrophoresis, Gel electrophoresis unit.
2. Media preparation
3. Aseptic techniques

28.
2. Media preparation
3. Aseptic culture technique
4. Explant culture-shoot tip, nodal segment
5. DNA isolation from plant parts.
6. Gel electrophoresis technique

Suggested Books:


Paper-II
PLANT PHYSIOLOGY AND BIOCHEMISTRY
(2 hrs/week)

Unit-1

Unit-2
Photosynthesis: Pigments, Photosynthetic apparatus, light reaction, photosystem I & II, Z scheme, photophosphorylation, C3 (Calvin cycle), C4 cycle, and factors affecting the photosynthesis.
Respiration - Aerobic and anaerobic respiration; RQ (Respiratory Quotient), Kreb's cycle, electron transport system, oxidative phosphorylation, and factors affecting the process. Fermentation.

Unit-3
Carbohydrates: Introduction, importance, nomenclature, classification, molecular structure & function of mono, di and polysaccharides, their properties, glycosidic linkages and glycoprotein.
Proteins: Amino acids-structure, electrochemical properties, peptide bonds, chemical bonds and nomenclature, structure and classification of proteins, physical and chemical properties.

Unit-4
Phases of growth and development: Seed dormancy and germination, plant movement, Biological clock: their regulatory factors.
Phoportiodism & vernalisation: physiology and mechanism of action, concept of florigen and phytochrome.
Plant hormones: auxins, gibberellins, cytokinins, ethylene and ABA: discovery & physiological effects.

Suggested Readings:

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Practical Exercises:
1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature of permeability of plasma membrane.
4. To separate chloroplast pigments by solvent method.
5. To separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity - Catalase, peroxidase and amylase.
10. To demonstrate the tests for different types of carbohydrates and lipids.
11. Bioassay of growth hormone (auxin, cytokinin, gibberellin).
13. To demonstrate root pressure.
14. To demonstrate rate of transpiration by use of potometers.
16. To demonstrate anaerobic and aerobic respiration.
17. R.Q. by Ganong's respirometer.
Paper III
Pteridophytes, Gymnosperms & Palaeobotany
(2 hrs./week)

Unit-1

Unit-2
Morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Marsilea.

Characteristics of Gymnosperms, distribution and classification (K.R.Sporne).

Unit-3
Morphology, anatomy, reproduction and life cycle of Cycas, Pinus and Ephedra. Economic importance of Gymnosperms.

Unit-4

Suggested Laboratory Exercises:

1. Study of external morphology, anatomy of vegetative and reproductive parts of Psilotum, Selaginella, Equisetum and Marsilea
2. Study of external morphology, anatomy of vegetative and reproductive parts of Cycas, Pinus and Ephedra
3. Study of fossils and slades of fossils
4. Preparation of charts of Geological time scale

Suggested Readings


Cambridge University Press, U.K.

# BOTANY PRACTICAL EXAMINATION B. Sc PART-II

**SKELETON PAPER**

**M.M. 50**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Practical</th>
<th>Regular</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>Comment on the Tissue culture or Biotechnology technique</td>
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<td>5</td>
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<tr>
<td>1(b)</td>
<td>Exercise based on molecular biology</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Perform the given physiological experiment and write the principle, procedure, results based on observations and precautions involved.</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Perform the bio-chemical test of the given sample and discuss the observation giving reasons.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Make a suitable preparation of material “A” (Pteridophyte) (vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Make a suitable preparation of material “B” (Gymnosperm) (vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Comment upon spots (1-5)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>Viva-Voce</td>
<td>5</td>
<td>5</td>
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<tr>
<td>8</td>
<td>Practical record</td>
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<td><strong>TOTAL</strong></td>
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**TIME: 4 Hours**

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## 5. GEOLOGY

<table>
<thead>
<tr>
<th>Scheme</th>
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<tr>
<td>Paper-I</td>
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<tr>
<td>Paper-II</td>
<td>3 hs. duration</td>
<td>Max. Marks : 50</td>
</tr>
<tr>
<td>Practical one</td>
<td>3 hrs. duration</td>
<td>Max. Marks : 50</td>
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Min. Pass Marks : 18
University of Rajasthan

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

Paper-I: Palaeontology and Structural Geology

Section-A

Definition, Scope, sub-division, and relationship of palaeontology with other branches.
- Fossils-condition necessary for preservation, modes of preservation, uses. Elementary ideas about origin of life, evolution and fossil records.
- Skeletal morphology and geological distribution of following groups:
  - Foraminifers, Brachiopods-Mollusca (Lamellibranches, Gastropods and Cephalopods-Nautiloids, Ammonoids, Dibranchiata), Trilobites, Echinoids, Crinoïdoids and Corals.

Section-B

Gondwana Flora: morphological characters of the flora: Vertebraria, Glossopteris, Gangamopteris, Ptilophyllum.
- Unconformity: its kinds, recognition in the field and geological significance. Overlap and Offlap.

Section-C

Attitude of planes (Bleeding Planes) and lines. Dip (true and apparent), Strike, Pitch and Plunge. Uses of Clinometer: Bed: apparent and vertical thickness. Criteria to determine top and bottom sequence, Morphology of folds and faults, their geometric and genetic classification and recognition in the field. Elementary ideas of the mechanics of folding and faulting.

Practical
- Palaeontology: Identification, description and drawing of different views of the following fossils:
  - Nummulites, Calymene, Paradoxide, Trinucleus, Phacops, Olenus, Olenellus, Terebratula, Pecten, Spirifer, Rhymenella, Atrypa, athyris, Lingula, Strophonéa, Arca, Pecten, trigonia, Cardium, Hippurite, Vetus, Lima, Incergamus, Lopha, Gryphaea, Exogyra, Spondylus, Trochus, Conus, Naticia, Turritella, Physa, Murex, Cyprea, Bellerophone, Nautillus, Ganites, Ceratites,
Syllabus : B.Sc. Part-II

Perisphinctes, Belemnite, Cidaris, Hemiaspis, Glossoptris, Gangamopteris, Vertebraria, Ptilophyllum.

Structural Geology : Study of physiographic features in topographical maps and use of clinometer compass, drawing profiles and geological sections along given direction.

Simple dip and strike problems connected with true and apparent dips, true and vertical thickness and width of the outcrop, calculation and geometrical methods.

Completion of outerops : Determination of thickness of beds, identification of structural features in hand specimen, drawing of profiles and sections showing the following features : Simple beds, folds, faults, unconformities, overlaps, offlaps and intrusion.

Books recommended.


Paper-II : Petrology

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

Section-A

Nature and composition of magmas, plutonic, hypabyssal and volcanic rocks, intrusive and extrusive forms, structure and texture. Elements of classification of igneous rocks.

Crystallization of basaltic magma, Bowen's Reaction Principle, differentiation and assimilation.

Crystallization of unicomponent and bicomponent silicate melts. Disposition- Albite-Anorthite basalt system and variation of igneous rocks.

Study of common igneous rocks - Granite, rhyolite, gabbro, basalt, Pegmatite, dolerite, syenite, diorite and peridotite.

Section-B

Process of formation of sedimentary rocks - Weathering, decomposition, disintegration, transportation and deposition. Concept of lithification and diagenesis.

Sedimentary rocks - Structure, texture, residual, mechanically transported, chemical and organic deposits. Elementary idea of sedimentary environments and provenance.

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Study of common sedimentary rocks - sandstone, limestone, shale, conglomerate and greywacke.

**Section - C**

Metamorphism - agents and types; Concept of grade and facies of metamorphism; Texture, structure and classification of metamorphic rocks.

Types of metamorphism and their products, Cataclastic, thermal and regional metamorphism. Dynamothermal metamorphism of argillaceous and calcareous rocks.

Retrograde metamorphism and metasomatism; anatexis. Study of important metamorphic rocks: slate, schist, gneiss, granulite, marble.

**Practical**

Petrology: Neat drawing of different forms assumed by intrusive igneous rocks. Study and recording of the typical textures of plutonic, hypabyssal and volcanic rocks.

Megasopic study of the following igneous rocks: Granite, pegmatite, aplite, syenite, nepheline syenite, diorite, gabbro, norite, dunite, peridotite, basalt, obsidian, lamprophyre, phonolite, and trachyte.

Microscopic study of the following rocks: Granite, syenite, diorite, gabbro, dunite, pyroxenite, dolerite, phyllite and basalt.

Sedimentary and Metamorphic rocks: Study of typical textures of sedimentary and metamorphic rocks. Systematic megascopic and microscopic study of the following rocks types: Conglomerate, breccia, sandstone, arkose, greywacke, shale, limestone, slate, phyllite, schist, gneiss, marble, quartzite, mica schist and cherty slate.

**Book Recommended**

3. William, Turner & Gilbert, Petrography CBS Publisher, Delhi.
5. Hatch & Wales, Petrology.
7. Kerr: Optical Mineralogy, CBS Publisher, Delhi.
MATHEMATICS

Teaching: 3 Hours per Week per Theory Paper.
2 Hours per Week for Practical Paper

Examination:

<table>
<thead>
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<th>Min. Pax</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Science</td>
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<tr>
<td>Arts</td>
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<table>
<thead>
<tr>
<th>Paper - I</th>
<th>Real Analysis and Metric Space</th>
<th>Duration</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td></td>
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<td>3 hrs.</td>
<td>40 (Science)</td>
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<table>
<thead>
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<th>Paper - II</th>
<th>Differential Equations</th>
<th>Duration</th>
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<td>40 (Science)</td>
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<table>
<thead>
<tr>
<th>Paper - III</th>
<th>Numerical Analysis and Vector Calculus</th>
<th>Duration</th>
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<tbody>
<tr>
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<td></td>
<td>3 hrs.</td>
<td>40 (Science)</td>
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<td></td>
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<thead>
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<th>Practical</th>
<th>Numerical Methods</th>
<th>Duration</th>
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<td>2 hrs.</td>
<td>30 (Science)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>40 (Arts)</td>
</tr>
</tbody>
</table>

Note:
1. 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.

2. 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.

3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates.

4. Each candidate has to pass in Theory and Practical examinations separately.
Paper - I: Real Analysis and Metric Space
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 40 (Science)
53 (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: Real numbers as complete ordered field, Limit point, Bolzano-Weierstrass theorem, Closed and Open sets, Union and Intersection of such sets. Concept of compactness. Heine-Borel theorem. Connected sets.
Real sequences- Limit and Convergence of a sequence, Monotonic sequences.

Unit 2: Cauchy’s sequences, Subsequences, Cauchy’s general principle of convergence. Properties of continuous functions on closed intervals. Properties of derivable functions, Darboux’s and Rolle’s theorem.

Unit 3: Notion of limit, continuity and differentiability for functions of two variables. Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

Unit 4: Functions of bounded variations. Sequence and series of functions – Pointwise and Uniform convergence, Cauchy’s criterion, Weierstrass M-test, Abel’s test, Dirichlet’s test for uniform convergence of series of functions. Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.

Unit 5: Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set.
Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy sequence.

Reference Books:
5. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition), 2011.
Paper – II: Differential Equations
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: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact.

Unit 2: First order but higher degree differential equations solvable for x, y and p. Clairaut’s form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients, Complimentary function and Particular integral.


Unit 4: Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.


Reference Books:
Paper – III: Numerical Analysis and Vector Calculus
Teaching : 3 Hours per Week
Duration of Examination : 3 Hours
Max. Marks: 40 (Science)
54 (Arts)

Note: (i) 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.
(ii) Non-Programmable Scientific Calculators are allowed.


Unit 3: Relation between the roots and coefficients of general polynomial equation in one variable, transformation of equations, Descarte’s rule of signs, solution of cubic equations by Cardon’s method, biquadratic equations by Ferrari’s method. Numerical solution of Algebraic and Transcendental equations, Bisection method, Secant method, Regula-Falsi method, Iteration method, Newton- Raphson Method (derivation of formulae and rate of convergence only).

Unit 4: Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic equations. Partial Pivoting method, ill conditioned systems, Numerical solutions of ordinary differential equations of first order with initial condition using Picard’s, Euler and modified Euler’s method.

Unit 5: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient, Divergence and Curl. Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Reference Books:
Practical: Numerical Methods  
Teaching: 2 Hours per Week per Batch

<table>
<thead>
<tr>
<th>Examination:</th>
<th>Duration: 2 Hours</th>
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<tbody>
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<td>Scheme</td>
<td>Science</td>
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<tr>
<td>Max.Marks</td>
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<tr>
<td>Min.Pass Marks</td>
<td>10</td>
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Distribution of Marks:

Two Practicals one from each group

- 10 Marks each = 20 Marks (13 Marks each) = 26
- Practical Record = 05 Marks = 07
- Viva-voce = 05 Marks = 07
- Total Marks = 30 Marks = 40

**Group A:** Numerical integration using Trapezoidal and Simpson’s rules. Numerical solution of Algebraic and Transcendental equations using

**Group B:** Numerical Solution of system of linear equations by Gauss elimination, Jacobi and Guass-Seidel methods. Solution of linear differential equations of first order and first degree with initial condition using modified Euler's and Runge-Kutta Fourth order methods.

**Note:**
1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.
7. ECONOMICS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>72</td>
<td>200</td>
</tr>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
</tbody>
</table>

Each paper shall be of three hour duration and of 100 marks for Arts students and of 75 marks for Science students.

Paper-I Introductory Macro Economics

Paper-II (a) Elements of Statistics and Mathematics
(b) History of Economic Thought

Note: There will be two papers of Economics. Each paper shall consist of three parts. Part A shall contain question No 1 consisting of very short type X (Ten) questions. The candidate is required to answer each question in 20 words. Part B shall contain question No 2 consisting of V (five) questions. The candidate is required to answer each question in 100 words. Part C shall contain three essay type questions (one from each section) with internal choice.

A candidate will be required to attempt five questions in all. All questions of Part A and Part B are compulsory while rest 3 questions are to be attempted from parts C selecting one question from each section. All questions carry equal marks. Each question will carry 20 marks for Arts students and 15 marks for Science students.

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**Paper-I**

Introductory Macro Economics

Section-A


---

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Section-B


Section-C

Central Bank: Organizational set-up and functions of Central Bank (with special reference to RBI). Commercial Bank: Functions, Modern trends of Commercial Banking, Quantitative and Qualitative credit control by RBI. Money Supply: Meaning & Definition, four measures ($M_1$, $M_2$, $M_3$, and $M_4$). Monetary Policy: Objectives, Targets and Indicators, Transmission Mechanism.

Recommended Books:

5. Suraj B. Gupta: Monetary Economics, S. Chand and Co. Ltd.
6. L. N. Natharama, Parambhik Samashti Arthshastra, Ramesh Book Publishing House, Jaipur
Paper- II (a) : Elements of Statistics and Mathematics

Duration : 3 hrs
Max. Marks : 100

Section- A

Surds, Indices, Quadratic Equation, Logarithms, Permutation and combination, Binomial Theorem, Arithmetic Progression, Geometric Progression and Harmonic Progression, Analytical Geometry: Straight Line, Parabola and Hyperbola, Matrices and Determination, Solution of Simultaneous equations by Cramer’s rule and Matrix Inverse. Simple differentiation, Partial differentiation (involving two independent variables). Maxima, minima point of inflexion. Simple Integration involving one independent variable, Application in Economics (Elasticity, Average, Marginal concepts)

Section –B

Statistics-definition, nature and importance, Uses and relevance of statistical methods, Census and Sample survey, Methods of data collection and tabulation, Diagrammatic and Graphical representation of data; Measures of Central Tendency: Arithmetic Mean, Mode, Median, Geometric Mean, Harmonic Mean. Concept and Measures of Dispersion and Skewness.

Section – C

Simple Correlation : Karl Pearson’s and Rank Correlation, Regression analysis, Fitting of linear Regression lines using Least Square Method, Analysis of Time Series, Determination of trend by straight line trend equation, Index numbers, Interpolation (Binomial Expansion and Newton’s method), Association of Attributes.

(Note: Use of non-programmable calculator is permitted)
Books Recommended:
2. V.P. Gupta; Statistical Methods, Sultan Chand and Sons, New Delhi.
7. संस्कृत भाषा में जो एम डी के पदार्थविद्या में प्रारंभिक अध्ययन - ताजबनरहस्य अनुभव, आदर्श.
8. वैज्ञानिकसाधनांग्राम शासकीयों के भूमिका: नीतिशक्षा प्रायोजन गहरा।

Paper II (b) History of Economic Thought

Section – A


Section – B

Critics of the Classical School - Sismondi, Robert Owen, Friedrich List.

Books Recommended:

1. Louise Haney, History of Economic Thought, Surjit Publication, New Delhi
2. Eric Roll, History of Economic Thought, Faber and Faber (Rupa)
3. Gide and Rist: History of Economic Doctrine
# Geography

## Scheme of Examination

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
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<tr>
<td>Arts/Social Science</td>
<td>72</td>
<td>200</td>
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<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
<tr>
<td>Paper I</td>
<td>Resources Geography</td>
<td>Arts 75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science 50</td>
</tr>
<tr>
<td>Paper II</td>
<td>Human Geography</td>
<td>Arts 75</td>
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<tr>
<td></td>
<td></td>
<td>Science 50</td>
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<tr>
<td>Practical</td>
<td>18</td>
<td>Arts 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science 50</td>
</tr>
</tbody>
</table>

**Notes**

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations.

2. There will be a common paper for Arts and Science.

3. Q.1 will be compulsory and will cover the entire course of the paper.

   Q. No. 1 of 20% marks of the maximum marks be set in two parts.

   (a) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.

   (b) Part (b) will have 10 short answer questions carrying 10% marks of the maximum marks and candidates shall attempt any five items.

4. Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.

5. Candidate will attempt 5 questions in all including question No. 1 selecting at least one question from each section.

6. Practical examination will be conducted by the board of examiners.

7. The candidate will have to pass in theory and practical separately.

8. The non-collegiate candidates will have to attend a practical training camp of 48 hours at a college affiliated to the University of Rajasthan, Jaipur notified by the University from time to time in which Geography subject is taught on payment of fee fixed by the University. The candidates appearing at examination from any examination centre located in Jaipur City will attend the practical camp at the University Post Graduate Department on payment of fee fixed by the University. The candidate will procure Certificate of successful completion of practical training camp from the College/Department of Geography and produce the same at the time of practical examinations.

---

**Dr. Registrar**  
Academic  
University of Rajasthan, Jaipur
Paper I: Resources Geography

Section A

Nature, scope and significance of resources geography, definition and classification of resources: renewable and non-renewable resources, resource classification of Zimmerman. Natural Resources: Distribution, exploitation, uses and conservation of forest, water, soils, fisheries, mineral resources, energy resources (coal, petroleum, natural gas and non-conventional energy resources).

Section B

Human resources: Population growth, distribution and density, causes of inequalities, population-resources relationship and problems, Agricultural resources: fisheries and cereal crops: rice, wheat, maize and barley; beverages: tea, coffee and tobacco, commercial crops: cotton, rubber, jute, sugarcane, silk and artificial fibres. Agricultural regions of the world.

Section C

Concepts of Resources utilization, their conservation. environmental and cultural constraints in resource utilization, water conservation and rainwater harvesting, soil and forest resources conservation, land capability classes, resources regions of the world, resources regions of the India, economic regions of the India, sustainable development.

Recommended Readings:

गुर्जर, आर.के. एवं जाट, बी.सी. 2013: संसाधन भूगोल। पंचशील प्रकाशन, जयपुर।
कौशिक, एस.डी. 2010: संसाधन भूगोल। रस्तोगी पत्रिकेशान्स, मेघठ।
मामूर, बी. 1998: संसाधन भूगोल। रस्तोगी प्रकाशन, मेघठ।

Paper II: Human Geography

Section A

Definition, aims and scope of human geography, relation of human geography with other social sciences, Principles of human geography, essential facts of human geography

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University of XYZ
according to Brunhes and Huntington, schools of man-environment relations: determinism possibilism and neo determinism.

Section B


Section C

Migration of population: causes, types and impact; population regions and population policies in India. Rural settlements: factors affecting development of rural settlement, types and patterns of rural settlements, building materials and house types, urban settlements: process of urbanization, urban problems in India, impact of human activities on environment.

Recommended Readings:


Practicals

Scheme of examination

Min. Pass Marks: 18

<table>
<thead>
<tr>
<th>Activity</th>
<th>Bifurcation of Marks</th>
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<tbody>
<tr>
<td>Written test</td>
<td>24</td>
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<tr>
<td>Field survey and viva voce</td>
<td>10 + 04</td>
</tr>
<tr>
<td>Record and viva voce</td>
<td>08 + 04</td>
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</table>

Max. Marks: 50

Time

3 hrs.

2½ hrs.
N.B. 1. There shall be 6 questions in written paper selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All question carry equal marks.

**Section A**

Definition of cartography, types of cartographic symbols and their uses, drawing instruments and materials, classification and representation of data with the help of squares, rectangles, circles, spheres, ring, pyramids, wheel diagrams, traffic flow diagram, isochronic chart.

**Section B**

Classification and uses of maps, drawing of isopleth, choropleth, chorochromatic, choroschematic and dot maps (simple, multiple and multi colour), measures of central tendency and dispersion: mean, median, mode, quartiles, standard deviation.

**Section C**

Elements of map reading. History of topographical maps in India, Scheme of topographical mapping in India as per National Map Policy, 2005. Conventional symbols and interpretation of physical and cultural features on topographical maps.

Prismatic Compass survey: equipments, methods of measurement of bearings, correction of bearings, record of survey closing error and its corrections.

**Recommended Readings:**


शर्मा, जे.पी. 2011: प्रायोगिक भूगोल की रूपरेखा। रस्सीगी प्रकरणके, नेपाल।


<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Science</th>
<th>Arts</th>
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</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Statistical Inference</td>
<td>50 marks</td>
<td>65 marks</td>
</tr>
<tr>
<td>Paper II</td>
<td>Statistical Applications in Society and Industry</td>
<td>50 marks</td>
<td>65 marks</td>
</tr>
<tr>
<td>Paper III</td>
<td>Practical based on Paper I, II</td>
<td>50 marks</td>
<td>70 marks</td>
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</table>

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University of Rajasthan

<table>
<thead>
<tr>
<th>Total</th>
<th>150</th>
<th>200 Marks</th>
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</table>

**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.

**Paper I**

**Statistical Inference**

**Unit-I**


18 hours

**Unit-II**


18 hours

**Unit-III**


18 hours

**Unit-IV**


18 hours

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University of Rajasthan, J
Syllabus: B.Sc Part-II

Unit-V

Large sample tests- Testing of single mean, proportion. Testing of difference of means and proportions. Non-Parametric Tests- Definition, Merits & Limitations. Sign test for one sample and two sample cases. Run Test, Median test. 48 hours

REFERENCES


ADDITIONAL REFERENCES


Paper II

STATISTICAL APPLICATIONS IN SOCIETY AND INDUSTRY

Unit-I

Crude birth rate, General fertility rate, Specific fertility rate, Total fertility rate, Gross Reproduction Rate, Net Reproduction Rate.

**Unit-II**

**Unit-III**
Time Series Analysis: Definition & its different components, Illustrations: additive and multiplicative models. Different Methods for determination of trend & seasonal fluctuation along with their merits & demerits.

**Unit-IV**
Educational Statistics: Methods of standardization of scales and tests, Z-scores, t-scores, Standard scores, Percentile score, Intelligence Quotient and its measurement and uses: Validity of test scores, reliability of Scores and their determination.

**Unit-V**

**REFERENCES:**

ADDITIONAL REFERENCES:

Paper: III
Practical Paper
1. Tests of significance based on t, Chi-square, F. Testing of significance of sample correlation coefficient. Use of Z-transformation.
2. Large sample tests for means and proportions. Tests of goodness of fit and independence of attributes in contingency tables.
3. Non-parametric tests: Sign, Run-Median (for large samples)
5. Construction of Index Numbers by Laspeyres, Paasche's, Fisher's, Chain Base Indices. Consumer price index.
6. Tests for Index numbers.
7. Determination of trend in a time series and construction of seasonal indices.
8. Drawing of $\overline{X}$, $R$, np, p and C-Charts.
10. APPLIED STATISTICS

Marks Scheme

<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Science</th>
<th>Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Statistical Inference</td>
<td>50 mark</td>
<td>65 marks</td>
</tr>
<tr>
<td>Paper II</td>
<td>Statistical Applications in Society and Industry</td>
<td>50 mark</td>
<td>65 marks</td>
</tr>
<tr>
<td>Paper III</td>
<td>Practical based on</td>
<td>50 mark</td>
<td>70 marks</td>
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</table>
University of Rajasthan

Paper I, II

<table>
<thead>
<tr>
<th>Total</th>
<th>150</th>
<th>200 Marks</th>
</tr>
</thead>
</table>

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.

Paper I
Statistical Inference

Unit-I

Unit-II


Unit-III


Unit-IV

Testing of Hypothesis: Simple, Composite, Null and Alternative Hypothesis. Types of error, Critical region. BCR, Neyman-Person's Lemma (statement only) and its application. BCR in case of Binomial, Poisson, and Normal Population.

Unit-V

Large sample test: Testing of single mean, proportion. Testing of difference of means and proportions. Non-Parametric Tests-Definition, Merits & Limitations. Sign test (for one sample and two sample cases) Run Test, Median test.
REFERENCES

ADDITIONAL REFERENCES

Paper II

STATISTICAL APPLICATIONS IN SOCIETY AND INDUSTRY
(Course contents are same as that of subject statistics.)

Unit-I
18 hours

Unit-II
Economic Statistics : Index numbers- Definition, Applications of index numbers, Price relatives, Quantity & Value relatives, Link and Chain Relatives. Problems involved in computation of index number. Use of averages, Simple aggregate and Weighted average.

Unit-III

Time Series Analysis: Definition and its different components, illustrations, additive and multiplicative models. Different methods for determination of trend & seasonal fluctuation along with their merits & demerits.

Unit-IV

Educational Statistics: Methods of standardization of scales and tests, Z-scores, t-scores, Standard scores, Percentile scores. Intelligence Quotient and its measurement methods, Validity of test scores, Reliability of Test Scores and their determination.

Unit-V


REFERENCES:


ADDITIONAL REFERENCES:


7. Determination of mean and construction of confidence intervals.

6. Time series forecasts and consumer price index.

5. Construction of index numbers for Laspeyres, Paasche's, and Fisher.


3. Non-parametric tests: sign, runs, median, (for large samples).


1. Test of significance based on chi-square, r, F, and t-test.

(Paper III)

(Paper III)
SCHEME OF EXAMINATION:

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Max. Marks</th>
<th>Min. Passing Marks</th>
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<tbody>
<tr>
<td>Arts</td>
<td>200</td>
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<td>Science</td>
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<td>54 (Th.36 Pr.18)</td>
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<table>
<thead>
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<th>Nomenclature</th>
<th>Duration</th>
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<tr>
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<td>Arts</td>
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<tr>
<td>I</td>
<td>Psychopathology</td>
<td>3 Hrs.</td>
<td>75</td>
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<tr>
<td>II</td>
<td>Psychological Statistics</td>
<td>3 Hrs.</td>
<td>75</td>
</tr>
<tr>
<td>III</td>
<td>Practicals</td>
<td>3 Hrs.</td>
<td>50</td>
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</tbody>
</table>

NOTE:–

1. There will be three papers in Psychology. It will be common for Arts and Science. Each paper will be of 3 hours and would contain the entire course content of the paper.

Section-A will contain 10 questions of 20 words each. Each question will be of 1.5 marks for Arts students and 1 mark for Science students. Thus, Part-A will be of 15 marks for Arts students and of 10 marks for Science students.

Section-B will contain 7 questions of 50 words each, out of which students are required to attempt 5 questions. Each question will be of 3 marks for Arts students and of 2 marks for Science students. Thus, Part-B will be of 15 marks for Arts student and of 10 marks for Science students.

Section-C will contain 3 long questions each with internal choice. Each question will be of 15 marks for Arts students and 10 marks for Science students. Thus, Part-C will be of 45 marks for Arts students and 30 marks for Science students.
For clarification the distribution of marks is tabulated as below:

**ARTS**

<table>
<thead>
<tr>
<th>Section</th>
<th>No. of Questions</th>
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<tr>
<td>A</td>
<td>10</td>
<td>1.5</td>
<td>15</td>
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<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>03</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
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**SCIENCE**

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<th>Marks</th>
<th>Total</th>
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</thead>
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<tr>
<td>A</td>
<td>10</td>
<td>01</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>5 (Out of 7)</td>
<td>02</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>3 (with internal choice)</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>Total Marks</strong></td>
<td></td>
<td><strong>50</strong></td>
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</tbody>
</table>

2. Use of simple calculator will be allowed for statistical portions of all papers.

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**Paper-I**

**Psychopathology**

**Section-A’**

1. Introduction: Meaning of Normality and Abnormality, Characteristics of Abnormal Behaviour; Latest ICD and DSM Classification Systems.

2. Psychological Assessment: Clinical Interview; Diagnostic Tests- Intelligence, Neuropsychological, Personality; Behavioural and Bodily Assessment.

3. Symptomatology and Etiology of Abnormal Behaviour: Cognitive, Conative and Affective Symptoms; Biological, Psycho-Social, Socio-Cultural Causes.
Section-B


5. Somatoform and Mood Disorders: Nature, Clinical Picture and Types of Somatoform Disorders: Conversion Disorder and Hypochondriasis; Mood Disorders: Depression and Bipolar Disorder.

6. Substance-Related Disorders: Substance-Use and Substance-Induced Disorders; Alcohol-Related, Nicotine-Related and Sedative-Hypnotic/Anxiolytics-Related Disorders.

Section-C


9. Mental Health: Meaning and Components; Factors Influencing Mental Health, Measures for Promoting Mental Health.

Books Recommended:

- अरुण कुमार सिंह (2002) आधुनिक असामान्य मनोविज्ञान, दिल्ली, मोतीलाल बंसारसीदास।

Dr. Registrar
Academic
University of Rajasthan, Jaipur
Paper-II

Psychological Statistics

Section-A


Section-B


5. Correlation: Concept and Types- Pearson's Product Moment Correlation (for Ungrouped Data by Assumed Mean and Actual Mean); Spearman's Rank Order Correlation.

6. Hypothesis Testing and Inferences Making: Population and Sample, Types of Sampling, Standard error of Mean, 't' test (Independent group), Interpretation of 't' values, levels of Significance.

Section-C

7. Non Parametric Tests: Nature and Assumptions of Distribution-free Statistics; Chi-Square; Equal Probability, 2 x 2 Contingency Table; Median Tests.

8. ANOVA: Purpose and Assumptions of ANOVA. One way ANOVA


Dr. Registrar
Academic
City of Rajasthan, Jaipur
Books Recommended:

- कपिल एच.के. : सांख्यिकी के मूलसूत्र, आगरा, विनोदपुस्तकमंदिर।

Paper-III:

Practicals

1. Assessment of Mental Health.
2. Assessment of State and Trait Anxiety.
5. Assessment of Family Pathology.
6. Word – Association Test
7. Eight-State Questionnaire.
8. Neuropsychological Assessment.
9. Stress: Measurement and Analysis of Group Data (Mean and Median)
10. Stress: Measurement and Analysis of Group Data (t’ test)
12. TEXTILE-CRAFT

SCHEME:

<table>
<thead>
<tr>
<th></th>
<th>Paper-I</th>
<th>Paper-II</th>
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<tbody>
<tr>
<td><strong>1. Theory:</strong></td>
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<tr>
<td>3Hrs</td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
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<tr>
<td><strong>2. Practical:</strong></td>
<td></td>
<td></td>
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<tr>
<td>3Hrs</td>
<td>50</td>
<td></td>
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<tr>
<td>25</td>
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<td></td>
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<td><strong>3. Submission:</strong></td>
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<tr>
<td>50</td>
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<td></td>
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</table>

_Syllabus (Theory):

Paper-I: Weaving Theory-I

UNIT-I

Yarn numbering system – Indirect (cotton, metric, woollen and worsted count) and Direct (Tex and Denier)

Yarn Twist and their types, Balance of fabric

Methods of fabric construction: Braiding & Lacing, knitting, felting and weaving

UNIT-II

Types of loom- Shuttle & Shuttle less; introduction to shuttleless looms- airjet, waterjet, projectile and rapier loom

Preparation of Warp and Weft for weaving

Draft, Peg plan, Weave, Repeat, Design

[Signature]

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UNIT-III

Derivatives of Plain weave- Rib and Basket

Derivative of twill weave- Regular, Irregular, Left hand, Right hand,

Pointed and curved twill

Fabric defects, Selvedge, Types of Selvedge’s

Paper-II: Dyeing Theory -I

UNIT-I

Difference between dyeing and printing

Mechanical finishes- basic process of beating, singeing, napping,
calendaring and embossing.

UNIT-II

Stages of Dyeing (fibre, yarn & fabric)

Wool dyeing and silk dyeing

Dyeing machines- Jigger and Winch dyeing machine

UNIT-III

Steps of printing- preparation of cloth & colour

Methods of Direct printing- Block & Roller printing

Thickeners and types of thickeners

Practical (Paper-I)

1. Batik spot, crack, scratch and painting (samples)

2. Weave samples of derivatives of plain and twill weave
Practical (paper-II)

1. Introduction to motif, repeat and layout
2. Block printing- samples preparation
3. Concept of discharge printing

Submission (paper-I)

1. Assessment of samples
2. Any one article using batik

Submission (paper-II)

1. Assessment of samples
2. Any one article using block

Examination Scheme:

One Major Problem: 20 Marks
One Minor Problem: 15 Marks

Reference books:

Kulkarni, M.M., Weaving technology, Virindra publication, Jalgon
13. BIO-TECHNOLOGY

Scheme:

Min. Pass Marks: 36

Paper-I: 3 hrs. duration Max. Marks: 100
Paper-II: 3 hrs. duration Max. Marks: 50
Practical Min. Marks: 18 5 hrs. duration Max. Marks: 50

Paper-I: Biophysics and Molecular Biology Max. Marks: 50

Section - A

- Energetics of living body: Sources of heat, limits to temperature.
- Heat dissipation and conservation.
- Lambert-Beer-law, Spectrophotometry and colorimetry - Primary events in photosynthesis.
- Strategies of light reception in microbes, plants and animals.
- Correction of motion - Electrical properties of biological compartments. Electricity as a potential signal.
- Generation and reception of sonic vibrations. Hearing aids.
- Intra and inter-molecular interactions in biological systems. Spatial and charge compatibility as determinant of such interactions.
- Physical methods applied to find out molecular structure: X-ray, crystallography and NMR.
- General spectroscopy: UV, vis, fluorescence, atomic absorption, IR, Raman spectra.
- Physical methods of imaging into biological intact biological structure: Ultrasound, optical filters, X-ray, CAT scan, ECG, EEG, NMR imaging.

Section - B

Structural basis of life: Structure of DNA, DNA replication, RNA.
- prokaryotes and eukaryotes.
- DNA recombination molecular mechanisms in prokaryotes and eukaryotes.
- Insertion elements and transposons.
- Structure of prokaryotic genes.
- Prokaryotic transcription.
- Prokaryotic translation.
- Prokaryotic gene expression (lau, his, trap, catabolic repression).

Section - C

Structure of eukaryotic genes.
- Eukaryotic transcription.
- Eukaryotic translation.

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Eukaryotic gene expression transcription factors
- Gene expression in yeast.
- Gene expression in protozoan parasites.
- Gene organization and expression in mitochondria and chloroplasts.
- Post-transcriptional regulation of gene expression.

B.Sc. Part II
Paper-II: Immunology - Animal Cell Culture and Recombinant DNA Technology

Section A
- The immune system and immunity along with historical perspective.
- Antigen-antibody and their structure.
- The organs and the cells of the immune system and their function.
- Antigen-antibody interaction.
- Humoral and cell-mediated immunity (role of MHC and genetic restriction).

Section B
- Origin and diversity in the immune system.

Effectors and mechanisms.
- Immunity to infectious diseases, vaccines.

Metabolic capabilities of animal cells. Simulating natural conditions for growing animal cells.

Importance of growth factors of the serum.
Primary cultures - Anchorage dependence of growth. Non-anchorage dependent cells.
Secondary cultures. Transformed animal cells - Established continuous cell lines.

Commonly used animal cell lines - their origin and characteristics.
Growth kinetics of cells in culture.
Application of animal cell culture for studies on gene expression.

Organ culture
- Transfixion of animal cell: Selectable markers, HAT selection, Antibiotic resistance, etc.

Cell fusion: Transplantation of cultured cells, Differentiation of cells.
Section - C

What is gene cloning and why do we need to clone a gene?
Tools and techniques-plasmids and other vehicles genomic DNA, RNA, cDNA; RT
enzymes and other reagents technique, laboratory requirements.

Safety measures and regulations for recombinant DNA work

Choice and selection of the tools and techniques

Vehicles: Plastids, and bacteriophages; available phagemids, cosmids, viruses.

Purification of DNA from bacteria, plant and animal cells.

Manipulation of purified DNA, Introduction of DNA into living cells. Cloning vectors for E.coli.

Cloning vectors for organisms other than E.coli: yeast, fungi, plants-agrobacter, plant virus artificial viruses.

Application of cloning in gene analysis: How to obtain a clone of a specific gene.

Studying gene location structure, studying gene expression.

Gene cloning and expression of foreign genes in research and biotechnology. Production of protein from cloned gene.

Gene cloning in medicine: Pharmaceutical compounds, artificial insulin gene, recombinant vaccine, diagnostic reagents.

Practical: Bases on theory syllabus

MM: 50
14. GPEM (Garment Production and Export Management)
B.A./B.COM./B.SC.

THEORY PAPER-I
Fashion and Apparel Design

B.A./B.COM. MM- 30
B.SC. MM- 50

HRS-3

SECTION -A
TRADITIONAL COSTUMES

1. Study of traditional costumes of various regions of India.
2. History of costumes of Indian civilization.
3. Brief knowledge of world costumes: French, German, Greek, European.

SECTION -B
TECHNIQUES IN PATTERN MAKING

4. Eight head theory-principles and advantages.
5. Pattern making techniques - drafting, draping, flat pattern.
6. Colour and colour schemes, psychological effects of colour on clothes.
7. Fitting - principles of fitting, factors to be considered while fitting, common fitting problems, remedying fitting defects of bodice, sleeves, and skirts.

SECTION -C
DESIGN

8. Classification of design - structural and decorative
9. Elements and principles of design.

References:

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B.SC./B.A./B.COM. PART -II

PAPER-II

ELEMENTS OF MARKETING AND FINANCE

B.A./B.COM. - M.M  50

B.SC.-M.M. 60

HRS.-3

SECTION A


3. Branded vs nonbranded market.

4. Types of garments exported.

SECTION B

5. Elementary knowledge of working capital, factors affecting working capital, operating cycle.

6. Sources of finance.

7. Letter of credit


9. Various types of bills.

10. Insurance

SECTION C

Brief study of:

11. ECGC (export credit and guarantee corporation)

12. EIC (export inspection council)

13. IIP (Indian institute of packaging)

14. ICA (Indian council of arbitration)
References:
1. Srivastav and Aggarwal: Vipdan Prabandh.
4. Daver, R. S.: Salesmanship and Publicity.

B.Sc./B.A./B.Com. Part – II
Practical – I
Apparel Designing
B.A./B.Com. – M.M. 60

B.Sc.-M.M. 25

1. Colour wheel and colour scheme.
2. Introduction to eight head theory and stick figure 9.5", 10.5".
3. Developing an adult croquis from block figure.
4. Draping of garments on croquis (at least 8 sheets) using different colours schemes and occasions.
5. Preparation of a portfolio.

B.Sc./B.A./B.Com. Part – II
Practical – II
Clothing Construction
B.A./B.Com. – M.M. 60

B.Sc.-M.M. - 25

1. Pattern making:
   i. Child's basic block and sleeve block.
ii) sleeve variations: slash and spread method-puff, bell, legomutton bishops sleeves.

iii). sleeve bodice combination: Magyar, raglan, dolman sleeves.

iv). different types of collars.

v.) different types of yokes.

2. Stitching of each sleeve, collar, and yokes on bodice block.

3. Fashion designing (5 each) on sheet: baby frocks, a-line frocks, rompers, sunsuits, skirts and tops, bu-shirts with shorts.

4. Redesigning of old garment using the idea such as: to consider factors such as money, creativity, individuality, skills, needs,

i). piecing or patchwork


iii) use of decorative embroideries

iv) trims

v) paints and dyes

5. Introduction of fashion designing in fashion shows.

References:

1. Kallal Mary Jo, construction.


3. Ireland fashion designing drawing and presentation.

4. Renee Weiss Chase, CAD for fashion design.
Geology and Mining

Scheme:

Theory: Max Marks 100

Paper I: Petrology

3 hrs duration Max Marks 50

Paper II: Principles of Stratigraphy and Geology of India

3 hrs duration Max Marks 50

Practical (one)

4 hrs duration Max Marks 50

Paper I: Petrology

Section-A - Igneous Rocks

Composition of magmas; intrusive and extrusive forms; structure and texture; classification

Crystallization of basaltic magma; Bowen's Reaction Principle, differentiation

Study of common igneous rocks: Granite, syenite, gabbro, basalt, pegmatite, dolerite, syenite and peridotite

Section-B - Sedimentary Rocks

Process of formation of sedimentary rocks; lithification and diagenesis

Structure and texture of rocks; Elementary idea of sedimentary deposits, sedimentary environments and provenance.

Study of common sedimentary rocks: Sandstone, limestone, shale, conglomerate, and breccia
Section-C - Metamorphic Rocks

Agents and types of metamorphism; concept of grade and facies. Structure and classification.

Types of metamorphism and their products, metasomatism and metasyntheses.

Study of common metamorphic rocks: Marble, schist, gneiss, quartzite, slate.

Paper II: Principles of Stratigraphy and Geology of India

Section-A

Principles of stratigraphy; standard stratigraphic scale; principles of correlation.

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

Stratigraphic divisions in India and their equivalents.

Section-B

Stratigraphy, distribution, lithology and correlation of the Aravalli, Delhi and Vindhyan Supergroups of rocks.

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

Section-C

Lithology, succession, distribution and fossil content of Triassic of Spiti, Jurassic of Kachchh, Tertiary period, Siwalik Supergroup.

Origin, composition, distribution and age of Deccan Traps; Tectonic framework of India.
Practical

Study of typical textures of rocks; Megasconic study of common igneous, sedimentary and metamorphic rocks; Microscopic studies of granite, rhyolite, andesite, basalt, dolerite, limestone, sandstone, schist, gneiss, and marble.

- Mouth drawings of paleogeographical maps of India during Permo-Carboniferous:
  - Distribution of various geological formation in outline map of India; Identification and description of the representative stratigraphic rocks.
- Geological field work and collection of samples.
## Environmental Science

### Scheme:

**Theory**

<table>
<thead>
<tr>
<th>Max Marks: 100</th>
<th>Min. Marks: 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 1</td>
<td>Max Marks: 50</td>
</tr>
<tr>
<td>3 hours duration</td>
<td>Max Marks: 50</td>
</tr>
<tr>
<td>Paper 2</td>
<td></td>
</tr>
<tr>
<td>3 hours duration</td>
<td>Min. Marks: 18</td>
</tr>
<tr>
<td>Practical</td>
<td>Max Marks: 50</td>
</tr>
<tr>
<td>4 hours duration</td>
<td></td>
</tr>
</tbody>
</table>

### Note:

1. Two types of Question papers for each theory paper will be applicable. Total duration of 3 hours for each paper. One question paper will comprise of the objective questions and the other will be of descriptive type question.

2. Descriptive type question paper (to be given during 1st 2 hours of examination) will have 9 questions, 3 from each section out of which a student is supposed to attempt 4 questions selection at least 1 from each section. This portion of the paper will carry maximum 30 marks. Each descriptive question will be of 7.5 marks.

3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:
   
   a. Multiple choice type questions: 20 questions of ½ marks each.
   b. Fill in the blanks/one word/true or false type questions: 10 questions of ½ mark each.
   c. Very short answer type questions: 5 questions of 1 mark each
Paper I: Environmental Pollution

Section A
1. Sources and Classification of Air pollutants; aerosols, gases, vapors.
2. Meteorological Aspects; Factors affecting Air Pollution, wind roses, plume behavior, estimation of plume rise.
3. Air Pollution modeling; Dispersion models, Pasquill model, ASME model, Gaussian plume model, assumption, limitation applications.
4. Effects of Air Pollution; effects on economics, effects on environment and effects on human beings.
5. Global effects of Air Pollution, Green house effect, Global warming, climate change, Acid rains, Ozone depletion.
6. Air Pollution due to automobile; Vehicular emissions, Motor fuel combustion, automobile emission mechanism from various vehicles.

Section B
2. Different types of sources of water pollution.
3. Types of wastewater and its quantum.
4. Effects of water pollution on Environment(Soil, organisms, vegetation, crop plants)
5. Effects of water pollution on human beings.
6. Pollution of water by Industries and power plants.
7. Marine pollution; quantum, types of pollutants, effects on water quality, organisms and ultimate effects on human beings.

Section C
1. Various sources of Noise Pollution.
2. Methods of measurements of Noise Pollution.
3. Temporary effects of Noise Pollution on human beings.
4. Permanent effects of Noise Pollution on human beings.
5. Land pollution due to Municipal solid waste.
6. Pollution due to agricultural chemicals on land and crop plants.
Suggested Readings:

- Environmental Radiation and Thermal Pollution and their control, Acol Publication, New Delhi.

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Paper II: Computer Techniques, Environmental Biotechnology and Environmental Microbiology

Section A

1. Biotechnology and its possible role in Environmental conservation.
2. Oil Slicks, oil spills, pesticide, tannery food industries and applications of biotechnology.
5. Air Pollution abatement and Biotechnology (Bioscrubbers, Biobeds, Biotrickling filters).

Section B

1. Microbiology and its possible role in solution of Environmental Challenges.
2. Air borne diseases and causal organisms.
3. Water borne diseases and causal organisms.
4. Role of microbes in metal recovery.
5. Role of microbes in pest control.

Section C

1. Software MS Word and its possible role in environmental challenges.
2. Software XP and environmental Challenges.
3. Role of Websites and internet in environmental conservation.
4. Wind rose formation and its application in environmental monitoring.
Suggested readings


**Suggested Field and Laboratory Exercises**

1. Estimation of SPM (Suspended Particulate Matter) from heavy traffic and busy areas.
2. Estimation of CO₂.
4. Estimation of NOₓ.
5. Preparation of pollution roses.
6. Estimation of Noise Levels from busy areas.
7. Estimation of Noise Levels from Silence zone (Hospital area, sanctuaries, National Parks)
8. Estimation of pH of water.
10. Estimation of TDS of water.
12. Visit to various water harvesting structures (traditional water harvesting structures), ponds, bawries, kunds, kaccha tanka, pucca tanka.
13. Collection of water from surface water sources, tankas etc.
14. Estimation of pH, EC, TDS, Chlorides, Oxygen, alkalinity etc. from surface water sources of different locations.
15. Estimation of pH, EC, TDS, Chlorides, Oxygen and fluoride determination of ground water collected from different sources.
17. E-coil count and other microbe identification.
Syllabus: B.Sc. Part-II

17. COMPUTER APPLICATION
(Common for B.A./B.Com./B.Sc.)

Paper I: Data Base Management System
Science Comm./Arts.

Paper II: Structured Programming and Computer Graphics

Practical: Programming Laboratory

Duration of these papers will be 3 hours.

Paper I: Data Base Management System

- Introduction to DBASE, DBASE V commands, development of an application under DBASE using forms, screen and PTG files.
- Security considerations in database management systems.
- Performance improvement in databases.
- Advanced concepts: introduction to Oracle/Ingres or a similar RDBMS on a multiuser environment.
- Structured query language: Forming a report on a advanced RDBMS.
- Repetition of SQL in RDBMS using programming languages.
- System management: Use, management, security considerations.

Practical:

Design of a database for a business application, design of data entry forms and report layouts for this database. Creation of programs to access and manipulate database.

Development of a business application in RDBMS.

Paper II: Structured Programming and Computer Graphics

- Introduction, Need of structured programming, methods of documentation, methods of analyzing program requirements, data flow diagrams, entity relationship, flow charts.
- Various categories of programming languages (3GL, 4GL, etc.): introduction to C and COBOL. Program development in C using
structured programming concepts.


- Introduction to a page maker/ Ventura or a similar page layout program. Preparation of documents using DTP packages. Formatting various fonts, text, and character sets. Various types of printers used in DTP. Introduction to a commercial DTP system available in markets. Indian language fonts. Creation of Indian language fonts.

Practical

- Development of a business application using C.

- Preparation of a document and publishing it using DTP system.

- Creation of fonts.

- Managing a Microsoft Windows session. Creating groups and program items under 'Windows.' Turning 'Windows' for a computer system.

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18. ELECTRONICS

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 Min.-18 5 hrs. duration
Max. Marks: 50

Paper-I: Amplifier Circuits

Max. Marks: 33

Time: 3 Hours
Syllabus: B.Sc. Part-II

Five questions are to be set taking one from each unit (each question will have an internal choice). Students will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-1


Unit-2


Unit-3

Operational amplifiers, Differential amplifier, operational amplifiers as an integrator, differentiator, inverting amplifier, adder and subtractor amplifier, voltage comparator and logarithmic amplifier, Ideal and practical operational amplifier for offsets, input offset current and voltage, power supply using 741 operational amplifier, uses of operational amplifier as oscillator.

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Unit 4

Class A, B, and C operating conditions for power amplifiers, condition of maximum power transfer, special features of power transistors used for power amplification. Need of impedance matching in power amplifier, shunt feed power amplifier. Efficiency, distortion, power dissipation, and power amplification. Three-phase inverters of push pull amplifiers. Class A, B, and C push pull amplifiers using transistors.

Unit 5

Problems in amplifier circuit elements at high frequency. Equivalent circuit, wide band amplifiers, high and low frequency compensation, pulse response and testing of an amplifier. Tuned amplifiers (single and double tuned) and their uses. Overall amplification in radio and TV receivers (no mathematical derivations, only qualitative description).

Paper II- Rectifiers and Oscillators

Max Marks: 33
Time: 3 Hours

Five questions are to be set taking one from each unit (each question will have internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit 1

Half wave, Full wave and bridge rectifiers, Definition of ripple factor. Efficiency, voltage regulation, smoothing filters, L-section and π-section filters and their cascading. Filter efficiency. Metal rectifiers, common power supply, voltage regulation and V.R. tubes.
Syllabus: B.Sc. Part-II

Unit-2

Zener diode, Electronically regulated power supply, voltage multipliers, Troubles in low and high voltage power supply.

Barkhausen criterion for maintained oscillations, grid biasing, and self sustained oscillations. Tuned grids, Tuned emitters oscillator (Mainly transistor type), crystal controlled oscillators, R-C phase shift oscillators. Designing, Considerations of Hartley and Wien bridge oscillators.

Unit-3

Bistable multivibrator, Monostable and Bistable multivibrator (Collector coupled). Improvement of multivibrator response, synchronization. Triggering in relaxation oscillators.

Unit-4

Response of sinusoidal, Triangular and Rectangular waves to C-R and L-R circuits. Their uses as integrating and differentiating circuits.

Non-linear wave shaping circuits, Clipping and clamping circuits, slicer, limiter circuits, Limiting and clipping amplifiers, peaking circuits.

Unit-5

Terminology used to describe sweep generator, Fundamental sweep voltage generator, Transistor constant current sweep generator.

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References

1. Electron tube circuits J. Seeley
2. Engineering Electronics - Ryder
3. Handbook of Electronics - Gupta & Kumar
5. Electronics - V.P. Arora

Paper-III- Digital Computer and Programming

Max. Marks-34

Time: 3 Hours

Five questions are to be set taking one from each unit. Each question will have an internal choice. Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-1


Unit-2

Central Processing Unit, I/O units, Arithmetic Logic unit, Internal storage, Auxiliary storages like HDD, FDD, CD etc. Read only memory, Random Access Memory, Computer generations and classification.

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Unit 3

Algorithm—Definition and properties of algorithm, flow chart, symbols of flow chart, converting a flow chart into a high level language. Examples of simple algorithms in low level language, viz. machine language, assembly language, high level language like BASIC.

Unit 4

BASIC—BASIC characteristics, numeric constants and variables, arithmetic operators, expressions and functions, character string constants and variables, string operator, expressions and functions. Terminal features, system commands and editing: PRINT, REM, INPUT/OUTPUT statements.

Elementary BASIC programmes for numeric and string processing.

Unit 5

Flow of control—unconditional and conditional branching, relational logic operators, two way and multi way selection statements, nesting repetition statements.


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'.

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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) + Viva-voce = 30 (15 for each exp) + 10 (Viva-
- Voice) = 50 marks
- Practical record: 10 marks
- Total: 50 marks

Section A

1. To study high pass frequency filter.
2. To study low pass frequency filter.
3. To study RC differentiating circuit.
4. To study RC integrating circuit.
5. To study bridge rectifier with L & pi filter.
6. To study transistor biasing circuits.
7. Study of counters and shift registers.
8. To study bistable multivibrator (collector coupled).
9. To study Exclusive OR (XOR) gate and verify its truth table.
10. Solution of simple equations using analog computer.

Section B

1. To study analog to digital convertor circuit.
2. To study digital to analog convertor circuit.

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3. To study negative feedback amplifier.
4. To study triode value characteristics and calculate its parameters.
5. To study OP Amp as summing amplifier.
6. To study OP Amp as an inverter.
7. To study OP Amp as a non-inverter.
8. To study push-pull amplifier using transistor.
9. To study emitter follower and its frequency response.

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