V. B. S. Purvanchal University, Jaunpur

Syllabus

B.Sc.-Physics

B.Sc.-1

Sr.	Name of the Papers	Theoretical/Practical/ Viva-voce/Assignment	Maximum Marks	Duration (hours)
1.	Mechanics and wave motion	Theoretical	50	3.00
2.	Kinetic theory and thermodynamics	Theoretical	50	3.00
3	Circuit fundamentals and basic electronics	Theoretical	50	
4	Practical	Practical	50	
Total Marks = 200				

B.Sc-2

Sr.	Name of the Papers	Theoretical/Practical/ Viva-voce/Assignment	Maximum Marks	Duration (hours)
1.	Physical Optics and Lasers	Theoretical	50	3.00
2.	Electromagnetics	Theoretical	50	3.00
3	Elements of Quantum Mechanics, Atomic and Molecular Spectra	Theoretical	50	
4	Practical	Practical	50	
Total Marks =200				

B.Sc.-3

Sr.	Name of the Papers	Theoretical/Practical/ Viva-voce/Assignment	Maximum Marks	Duration (hours)
1	Relativity and Statistical Physics	Theoretical	75	3.00
2	Solid State and Nuclear Physics	Theoretical	75	3.00
3	Solid State Electronics	Theoretical	75	3.00
4	Practical	Practical	75	
Total Marks= 300				

- The question paper shall be divided into three sections.

Section-A: One question consisting of ten parts to be answered in about 50 words each.

(10×2=20 marks)

Section-B: Five short answer questions including at least two passages for explanation with internal choice. Each question shall be answered in about 200 words (5×10=50 marks)

Section-C: This section will have five long answer questions. Candidates will have to attempt any two of them in about 500 words each. (2×15=30 marks)

Note:-Candidate must obtain minimum pass marks in Theory and Practical Examinations separately.

B.Sc.-1
Physics
Paper-I
Mechanics and Wave Motion

M.M.: 50 Duration:-3.00 hours

UNIT-I

Inertial reference frame, Newton's laws of motion, Dynamics of particle in rectilinear and circular motion, Conservative and Non -conservative forces, Conservation of energy, liner momentum and angular momentum, Collision in one and two dimensions, cross section.

UNIT-II

Rotational energy and rotational inertia for simple bodies, the combined translation and rotational and motion of a rigid body on horizontal and inclined planes, Simple treatment of the motions of a top. Relations between elastic constants, bending of Beams and Torsion of Cylinder.

UNIT-III

Central forces, Two particle central force problem, reduced mass, relative and center of mass motion, Law of gravitation, Kepler's laws, motions of planets and satellites, geo stationary satellites.

UNIT-IV

Simple harmonic motion, differential equation of S. H. M. and its solution, uses of complex notation, damped and forced vibrations, composition of simple harmonic motion.

Differential equation of wave motion, plane progressive waves in fluid media, reflection of waves, phase change on reflection, superposition, stationary waves, pressure and energy distribution, phase and group velocity.

Text and reference books

1. EM Purcell, Ed - Berkeley Physics Course, Vol. 1, Mechanics, McGraw- Hill.
2. R P Feymman, RB Lighton and M Sands - The Feymman Lectures in Physics, Vol.-1, BI Publications, Bombay, Delhi, Calcutta, Madras.

3. J.C. Upadhyay - Mechanics.
4. P.K. Srivastava - Mechanics, New Age International.

B.Sc.-1
Physics
Paper-II
KINETIC THEORY AND THERMODYNAMICS

M.M.: 50 Duration:-3.00 hours

UNIT-I

Ideal Gas: Kinetic model, Deduction of Boyle's law, interpretation of temperature, estimation of r.m.s. speeds of molecules. Brownian motion, estimate of the Avogadro number. Equipartition of energy, specific heat of monatomic gas, extension to di- and triatomic gases, Behaviour at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics.

Real Gas : Vander Waals gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapour. Joule expansion of ideal gas, and of a Vander Waals gas, Joule coefficient, estimates of J-T cooling.

UNIT-II

Liquefaction of gases : Boyle temperature and inversion temperature. Principle of regenerative cooling and of cascade cooling, liquefaction of hydrogen and helium gas. Refrigeration cycles, meaning of efficiency.

Transport phenomena in gases : Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

UNIT-III

The laws of thermodynamics : The Zeroth law, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics. Different versions of the second law, practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero; third law of thermodynamics. Thermodynamic relationships: Thermodynamic variables; extensive and intensive, Maxwell's general relationships, application to Joule Thomson cooling and adiabatic cooling in a general system, Vander Waals gas,

Clausius-Clapeyron heat equation. Thermodynamic potentials and equilibrium ofthermodynamical systems, relation with thermodynamical variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

UNIT-IV

Blackbody radiation: Pure temperature dependence, Stefan-Boltzmannlaw, pressure of radiation, spectral distribution of Black body radiation, Wien's displace mentlaw, Rayleigh-Jean's law, The ultraviolet catastrophy, Plank's Law, Kirchaff's Law: absorption and emission.

Text and Reference Books

1. G.G. Agarwal and H.P. Sinha-Thermal Physics
2. S.K. Agarwal and B.K. Agarwal-Thermal Physics

B.Sc.-1
Physics
Paper-III
CIRCUIT FUNDAMENTALS AND BASIC ELECTRONICS

M.M.: 50 Duration:-3.00 hours

UNIT-I

Growth and decay of currents through inductive resistances, charging and dischargingin R.C. and R.L.C. circuits, Time constant, Measurement of high resistance. A.C. Bridges, Maxwell's and Scherings Bridges, Wien Bridge. THEVENIN, NORTON and Superposition theorems and their applications.

UNIT-II

Semiconductors, intrinsic and extrinsic semiconductors, n-type and p-typesemiconductors, unbiased diode forward bias and reverse bias diodes, diode as a rectifier, diode characteristics, zener diode, avalanche and zener breakdown, power supplies, rectifier, bridge rectifier, capacitor input filter, voltage regulation, zener regulator.

Bipolar transistors, three doped regions, forward and reverse bias, DC alpha, DC beta transistor curves.

UNIT-III

Transistor biasing circuits: base bias, emitter bias and voltage divider bias, DC load line. Basic AC equivalent circuits, low frequency model, small signal amplifiers, common emitter amplifier, common collector amplifiers, and common base amplifiers, current and voltage gain,

R.C. coupled amplifier, gain, frequency response, equivalent circuit at low, medium and high frequencies, feedback principles.

UNIT-IV

Input and output impedance, transistor as an oscillator, general discussion and theory of Hartley oscillator only.

Elements of transmission and reception, basic principles of amplitude modulation and demodulation. Principle and design of linear multimeters and their application, cathode ray oscillograph and its simple applications.

Text and Reference Books

1. B.G. Streetman- Solid State Electronic Devices, 2nd Edition (Prentice Hall of India, New Delhi, 1986).
2. W.D. Stanley- Electronic Devices, Circuits and Applications (Prentice-Hall, New TTC'A 1flOO\ JL4y, JJI. 1OO).
3. J.D. Ryder- Electronics Fundamentals and Application, 2nd Edition (Prentice-Hall of India, New Delhi, 1986).
4. J Millman and A Grabel- Microelectronics, International Edition (McGraw Hill Book Company, New York, 1988).

B.Sc.-1
Physics
Paper-IV
PRACTICAL

M.M. 50

- Distribution of marks-30 marks (Two Practicals) + 10 marks (Viva-voce) + 10 marks (Record)
- Every institution may add any experiment of the same standard in the subject.

Mechanics

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. Study of conservation of momentum in two dimensional oscillations.

Oscillations

1. Study of a compound pendulum.
2. Study of damping of a bar pendulum under various mechanics.
3. Study of oscillations under a bifilar suspension.
4. Potential energy curves of a 1-Dimensional system and oscillations in it for various amplitudes.
5. Study of oscillations of a mass under different combinations of springs.

Properties of matter

1. Study of bending of a cantilever or a beam.
2. Study of torsion of a wire (static and dynamic methods)

Kinetic theory of matter

1. Study of Brownian motion.
2. Study of adiabatic expansion of a gas.
3. Study of conversion of mechanical energy into heat.
4. Heating efficiency of electrical kettle with varying voltages.

Thermodynamics

1. Study of temperature dependence of total radiation.
2. Study of temperature dependence of spectral density of radiation.
3. Resistance thermometry.
4. Thermo-emf thermometry
5. Conduction of heat through poor conductors of different geometries.

Circuit fundamentals

1. Charging and discharging in R.C. and R.C.L. circuits.
2. High resistance by leakage.
3. A.C. Bridges.
4. Half wave and full wave rectifiers.
5. Characteristics of a transistor in CE,CB and CC configurations
6. Frequency response of R.C. coupled amplifier.

Waves

1. Speed of waves on a stretched string.
2. Studies on torsional waves in a lumped system.
3. Study of interference with two coherent sources of sound.

Text and reference books

1. D.P. Khandelwal-A laboratory manual for undergraduate classes (Vani Publishing House, New Delhi).
2. S.P. Singh-Advanced Practical Physics (Pragati Prakashan, Meerut). Worsnop and Flint-Advanced Practical physics for students.

B.Sc.-2
Physics
Paper-I
PHYSICAL OPTICS AND LASERS

M.M.: 50 Duration:-3.00 hours

UNIT-I

Interference of a light : The principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refract meter and other applications. Localized fringes; thin films, applications for precision measurements for displacements.

Haidinger fringes : Fringes of equal inclination. Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Antireflection Coating, Optical filters. Intensity distribution in multiple beam interference, Tolansky fringes, Fabry- Perrotinterferometer and etalon.

UNIT-II

Fresnel diffraction: Fresnel half-period zones, plates, straight edge, rectilinear propagation.

Fraunhoffer diffraction: Diffraction at a slit, half-period zones, phases diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems, outline of phase contrast microscopy.

Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating and reflection grating, and blazed gratings. Concave grating and different mountings. Resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perrot etalon.

UNIT-III

Polarization, Double refraction in uniaxial crystals, Nicol prism, polaroids and retardation plates, Babinet's compensator. Analysis of polarised light.

Optical activity and Fresnel's explanation, Half shade and Biquartz polarirneters

Matrix representation of plane polarized waves, matrices for polarizers, retardation plates and rotators, Application to simple systems.

UNIT-IV

Laser system: Purity of a special line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, spontaneous and induce emissions, conditions for laser action, population inversion, 3 and 4 Level Systems with Example (He-Ne).

Application of Lasers: Pulsed lasers and tunable lasers, spatial coherence and directionality, estimates of beam intensity; temporal coherence and spectral energy density.

Text and Reference Books

1. A K Ghatak-Physical Optics (Tata McGrew Hill).
2. D P Khandelwal-Optics and Atomic Physics (Himalaya, Publishing House, Bombay, 1988).
3. F Smith and JH Thomson- Manchester Physics series, Optics (English Language Book Society and John Wiley, 1977).
4. Born and Wolf- Optics
5. KD Moltey - Optics (Oxford University Press).
6. Sears- Optics.
7. Jonkins and White- Fundamental of Optics (McGraw-Hill).
8. Smith and Thomson- Optics (John Wiley and Sons).
9. B.K; Mathur- Optics.
10. P.K. Srivastava- Optics (CBS).
11. B. B. Laud- Laser (New Age).

B.Sc.-2
Physics
Paper-II
ELECTROMAGNETICS

M.M.: 50 Duration:-3.00 hours

UNIT-I

Electrostatics

Coulomb's law, Electric Field and potentials, Field due to a uniform charged sphere, Derivations of Poisson and Laplace Equations, Gauss Law and its application: The Field of a conductor. Electric dipole, Field and potential due to an electric dipole, Dipole approximation for an arbitrary charge distribution, Electric quadruple, Field due to a quadruple , Electrostatic Energy of a charged uniform sphere, Energy of a condenser.

Magneto statics

Magnetic field, Magnetic force of a current, Magnetic Induction and Biot-Savart Law, Lorentz Force, Vector and Scalar Magnetic potentials, Magnetic Dipole, Magneto motive force and

Ampere's Circuital theorem and its applications to calculate magnetic field due to wire carrying current and solenoid.

UNIT-Il

Electromagnetic Induction

Laws of Induction, Faraday's laws and Lanz's Law. Mutual and Self Induction, Vector potential in varying Magnetic field, Induction of current in continuous media, Skin effect, Motion of electron in changing magnetic field , Betterton , Magnetic energy in field, Induced magnetic field (Time varying electric field), Displacement current, Maxwell's equations, Theory and working of moving coil ballistic galvanometer.

UNIT-III

Dielectrics

Dielectric constant, polarization, Electronic polarization, Atomic or ionic Polarization charges, Electrostatic equation with dielectrics, Field, force and energy in Dielectrics.

Magnetic Properties of Matter

Intensity of magnetization and magnetic susceptibility, Properties of Diaz, Para and Ferromagnetic materials, Curie temperature, Hysteresis and its experimental determination.

UNIT-IV

Electromagnetic Waves

The wave', equation satisfied .by E and B, plane electromagnetic waves in vacuum, Poynting's vector, reflection at, a plane boundary of dielectrics, polarization by reflection and total internal reflection, Faraday effect; waves in a conducting medium, reflection and refraction by the ionosphere

Text and Reference Books

1. Berkeley Physics Course- Electricity and Magnetism, Ed. E.M. Purcell (Mc GrawHill).
2. Halliday and Resnik-Physics, Vol 2.
3. D J Griffith-Introduction to Electrodynamics (Prentice-Hall of India).
4. Reitz and Milford-Electricity and Magnetism (Addison-Wesley).
5. A S Mahajan and A A Rangwala-Electricity and Magnetism (Tata McGraw- Hill).
6. A M Portis-Electromagnetic Fields.
7. Pugh and Pugh-Principles of Electricity and Magnetism (Addison-Welsley).
8. Panofsky and Phillips-Classical Electricity and Magnetism (India Book House).
9. S S Atwood-Electricity and Magnetism" (Dover).

B.Sc.-2
Physics
Paper-III
ELEMENTS OF QUANTUM MECHANICS, ATOMIC AND MOLECULAR SPECTRA

M.M.: 50 Duration:-3.00 hours

UNIT-I

Matter Waves

Inadequacies of classical mechanics, Photoelectric phenomenon, Compton effect, wave particle duality, de- Broglie matter waves and their experimental verification, Heisenberg's Uncertainty principle, Complementarity principle, Principle of superposition, Phase and Group Velocity .

UNIT-II

Schrodinger Equation and its Applications

Schrodinger wave equation Interpretation of wave function, Expectation values of dynamical variables, Ehrenfest theorem, Orthonormal properties of wave functions, One dimensional motion in step potential, Rectangular barrier, Square well potential, Particle in a box, normalization Simple Harmonic Oscillator.(Qualitative)

UNIT-III

Atomic spectra

Spectra of hydrogen, deuteron and alkali atoms, spectral terms, doublet fine structure, screening constants for alkali spectra for s, p. d, and f states, selection rules. Singlet and triplet fine structure in alkaline earth spectra, L-S and J-J couplings. Weak spectra: continuous X-ray spectrum and its dependence on voltage, Duane and Haunt's law. Characteristics X-rays, Moseley's law, doublet structure and screening parameters in X-ray spectra, X-ray absorption spectra.

UNIT-IV

Molecular spectra

Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies, determination of antinuclear distance, pure rotation and rotation- vibration spectra, Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra.

Text and Reference Books

1. H S Mani and G K Mehta-Introduction to Modern Physics (Affiliated East- West Press 1989).
2. A Beiser-Perspectives of Modern Physics.
3. H E White-Introduction to Atomic Physics.
4. Barrow-Introduction to Molecular Physics.
5. R P Feymann, R B Leighton and M Sands-The Feyrnann Lectures on Physics, Vol. III (B I Publications. Bombay. Delhi, Calcutta, Madras).
6. T A Littlefield and N Thorley-Atomic and Nuclear Physics (Engineering Language Book Society).
7. Eisenberg and Resnik-Quantum Physics of Atoms, 'Molecules, Solids, Nuclei and Particles (John Wiley).
8. D P Khandelwal-Optics and Atomic Physics (Himalaya Publishing House, Bombay, 1988).

B.Sc.-2
Physics
Paper-IV
PRACTICAL

M.M.: 50

- ***Note :*** This is a suggested list. Every institution may add any experiment of same standard in the same subject area.
- Distribution of marks- 50 marks (Two Practicals) +15 marks (Viva-voce) + 10 marks (Record)

Physical optics

1. Study of interference of light (bi prism or wedge film).
2. Study of F-P etalon fringes.
3. Study of diffraction at a straight edge or a single slit.
4. Use of diffraction grating and its resolving limit.
5. Resolving limit of a telescope system.
6. Polarization of light by the reflection.
7. Study of optical rotation for any system.

Electrostatics

1. Characteristics of a ballistic galvanometer.
2. Setting up and using an electroscope or electrometer.

Moving charges and Magneto statics

1. Use of a vibration magnetometer to study a field.

2. Study of field due to a current.
3. Measurement of low resistance by Carey-Foster bridge or otherwise.
4. Measurement of inductance using impedance at different frequencies.
5. Measurement of capacitance using impedance at different frequencies.
6. Study of decay of currents in LR and RC circuits.
7. Response curve for LCR circuit and resonance frequency and quality factor.

Varying fields and electromagnetic theory

1. Sensitivity of a cathode-ray oscilloscope.
2. Characteristic of a choke.
3. Measurement of inductance.
4. Study of Lorentz force.
5. Study of discrete and continuous LC transmission lines.

Atomic Physics

1. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron to proton).
2. Absorption spectrum of iodine vapor.
3. Study of alkali or alkaline earth spectra using a concave grating.
4. Study of Zeeman Effect for determination of Landed g-factor.

Molecular Physics

1. Analysis of a given band spectrum.
2. Study of Raman spectrum using laser as an excitation source

Lasers

1. Study of laser as a monochromatic coherent source
2. Study of divergence of a laser beam

Text and Reference Books

1. D.P. Khandelwal-A Laboratory Manual for Undergraduate Classes (Vani Publishing House, New Delhi).
2. S.P. Singh-Advanced Practical Physics (Pragati Prakashan, Meerut).
3. Worsnop and Flint-Advanced Practical physics for students.

B.Sc.-3
Physics
Paper-I
RELATIVITY AND STATISTICAL PHYSICS

M.M.: 50 Duration:-3.00 hours

UNIT-I

Relativity

Reference systems, inertial frames, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment; search for ether.

Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero rest mass.

UNIT-II

Statistical physics

The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a prior probabilities, probability distribution and its narrowing with increase in number of particles. The expressions for average properties. Constraints; accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states.

UNIT-III

Some universal laws: The μ (mu)- space representation, division of μ (mu)- space into energy sheets and into phase cells of arbitrary size, applications tone-dimensional harmonic oscillator and free particles. Equilibrium before two systems in thermal contact, bridge with macroscopic physics. Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. Boltzmann canonical distribution law and its applications; rigorous form of equipartition of energy.

UNIT-IV

Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean, r.m.s. and most probable speed values. Doppler broadening of spectral lines.

Transition to quantum statistics: 'h' as a natural constant and' its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator, In distinguishability

of particles and its consequences, Bose-Einstein and Fermi-Dirac distributions, photons in black body chamber, free electrons in a metal, Fermi level and Fermi energy.

Text and Reference Books

1. Beiser-Concepts of Modern Physics (McGraw-Hill).
2. B. B. Laud-Introduction to Statistical Mechanics (Macmillan 1981). F Reif, Statistical Physics (McGraw-Hill 1988).
3. K Haung-Statistical Physics (Wiley Eastern, 1988).

B.Sc.-3
Physics
Paper-II
SOLID STATE AND NUCLEAR PHYSICS

M.M.: 75 Duration:-3.00 hours

UNIT-I

Crystal Structure

Lattice translation vectors and lattice, Symmetry operations, Basis and Crystal structure, Primitive Lattice cell, Two-dimensional lattice types, systems, Number of lattices, three dimensional lattice types, Systems, Number of Lattices. Index system for crystal planes Miller indices, Simple crystal structures, Na Cl, hcp, diamond, Cubic ZnS; and hexagonal.

Crystal Diffraction and Reciprocal Lattice

Bragg's law, Experimental diffraction method, Laue method, Rotating crystal method, Powder method, Derivation of scattered 'wave amplitude, Atomic term factor, Reciprocal lattice vectors, Diffraction conditions, Ewald's method, Reciprocal lattice to sc, bcc and fcc lattices.

UNIT-II

Crystal Bonding's

Crystal of inert gases, Van der Walls-London interaction, repulsive interaction, Equilibrium lattice constants, Cohesive energy, compressibility and bulk modulus, ionic crystal, Made lung energy, evaluation of Made lung constant, Covalent crystals, Hydrogen-bonded crystals, Atomic radii.

Lattice Vibrations

Lattice Heat capacity, Einstein model, Vibrations of monatomic lattice, derivation of dispersion relation, First brillouin zone, group velocity, continuum limit, Force constants, Lattice with two

atoms per primitive cell, derivation of dispersion relation, Acoustic and optical modes, Phonon momentum.

UNIT-III

Hall Effect in metals. Origin of band theory, Qualitative idea of Bloch theorem, Kronig-Penney model, Number of orbitals in a band, conductor, Semi- conductor and insulators, Effective mass, Concept of holes.

UNIT-IV

Nuclear Physics

General Properties of Nucleus:

Brief survey of general Properties of the Nucleus, Mass defect and binding energy, charges, Size, Spin and Magnetic moment.

Nuclear Forces:

Saturation phenomena and Exchange forces, Deutron ground state properties.

Nuclear Models:

Liquid drop model and Bethe Weiszacker mass formula.

Nuclear Reactions:

Nuclear reactions and their conservation laws, Cross section of nuclear reactions, Theory of fission (Qualitative), Nuclear reactors and nuclear fusion.

Elementary Particles:

Basic classification based on rest mass, Spin and half life, particle interactions (gravitational, Electromagnetic, week and strong Interactions).

Text and Reference Books

1. Pun and Babbar - Solid State Physics (S. Chand).
2. C. Kittel - Introduction to Solid State Physics, 6th Edition (John Wiley & Sons).
3. H.S. Mani and G.K. Mehta - Introduction to Modern Physics (Affiliated East-West Press, 1989).
4. A. Beiser - Perspectives of Modern Physics.
5. T.A. Littlefield and N. Thoreley - Atomic and Nuclear Physics (Engineering Language Book Society).

6. Eisenberg and Resnik - Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and Particles (John Wiley).
7. Ghoshal S.N. - Nuclear Physics, S. Chand & Co.

B.Sc.-3
Physics
Paper-III
SOLID STATE ELECTRONICS

M.M.: 75 Duration:-3.00 hours

UNIT-I

Diffusion of minority carriers in semiconductor, work function in metals and semiconductors Junctions between metal and semiconductors, Semiconductor and semiconductor, p.n. Junction, Depletion layer, Junction Potential Width of depletion layer, Field and Capacitance of depletion layer, Forward A.C. and D.C. resistance of junction, Reverse Breakdown.

Zener and Avalanche diodes, Tunnel diodes, Point contact diode, their importance at High frequencies, LED photodiodes, Effect of temperature on Junction diode Thermistors.

UNIT-II

Transistor parameters, base width modulation, transit time and life-time of minority carriers, Base-Emitter resistance Collector conductance, Base spreading resistance, Diffusion capacitance, Reverse feedback ratio, Equivalent circuit for transistors, Basic model, hybrid model and Y parameter equivalent circuit, Input and output impedances.

UNIT-III

Current and Voltage gain, Biasing formulae for transistors, Base bias, emitter bias and mixed type bias and mixed type biasing for small and large signal operation. Transistor circuit application at law frequencies, their AC and DC equivalent for three different modes of operation, Large signal operation of transistors, Transistor Power amplifiers, Class A and B operation, Maximum power output Effect of temperature, heat sinks, thermal resistance Distortions in amplifiers, cascading of stages, Frequency response, Negative and positive feedback in transistor amplifiers.

UNIT-IV

Field effect transistors and their characteristics, biasing of FET, use in preamplifiers, MOSFET and their simple uses.

Power Supplies:

Electronically regulated low and high voltage power supplies, Inverters for battery operated equipment's.

Miscellaneous:

Basic linear integrated circuits, phototransistors, Silicon Controlled rectifiers,

Power Supplies:

Electronically regulated low and high voltage power supplies, Inverters for battery operated equipment's.

Miscellaneous:

Basic linear integrated circuits, phototransistors, Silicon Controlled rectifiers, unijunction transistor and their simple uses.

Text and Reference Books

1. B G Streetman-Solid State Electronic Devices, UK Edition (Prentice-Hall of India. New Delhi, 1986).
2. W D Stanley-Electronic Devices, Circuits and Applications (Prentice-Hall, New Jersey, USA. 1988).
3. J D Ryder-Electronics Fundamentals and Applications, 2nd Edition\(Prentice-Hall of India. New Delhi, 1986).
4. I Miliman and A Grabel-Microelectronics, International. Edition (McGraw-Hill Book Company, New York, 1988).

B.Sc.-3
Physics
Paper-IV
PRACTICAL

M.M.: 75

Note : This is a suggested list. Every institution may add any experiment of same standard in the same subject area.

Distribution of marks- 50 marks (Two Practicals) +15 marks (Viva-voce) + 10 marks (Record)

Statistical Physics

1. Data from n-option systems of several relative weightages to be examined and interpreted.
2. Plotting F-D distribution in the neighborhood of Fermi energy for different temperature values.
3. Solar wind as a thermal expansion of solar corona at one million Kelvin.
4. Study of dilute gas for experimental verification of Maxwell-Boltzmanstatistics.

5. Number of microscopic states of perfect gas (Gibbs-paradox).

Solid State Physics

1. Goniometric study of crystal faces.
2. Determination of dielectric constant.
3. Hysteresis curve of transformer core.
4. Hall-probe method for measurement of magnetic field

Solid State Devices

1. Specific resistance and energy gap of a semiconductor
2. Characteristics of a transistor
3. Characteristics of a tunnel diode

Electronics

1. Study of voltage regulation syste
2. Study of, a regulated power supply
3. Study of Lissajuous figures using a CR0
4. Study of VTVM
5. Study of RC and TC coupled amplifiers
6. Study of AF and RF oscillators

Nuclear Physics

1. Study of absorption of alpha and beta rays.
2. Study of statistics in radioactive measurement.

Text and Reference Books

1. B.G. Strechman-Solid State Electronic Devices. 2nd Edition (Prentice-Hall of India, New Delhi, 1986).
2. W.D. Stanley- Electronic Devices, Circuits and Applications (Prentice-Hall, New Jersey, USA, 1988).
3. D.P. Khandelwal-A Laboratory Manual for Undergraduate Classes (Vani Publishiing House, New Delhi).
4. S.P. Singh-Advanced Practical Physics (Pragati Prakashan, Meerut).