B.Sc. Physics Syllabus

Offered by

VKSU, Ara

B.Sc.(Hons.) Physics Part-I

The course shall consists of two theory papers-I and II each of 75 marks. The pass marks in the two papers taken together will be 67 and examination in each will be of 3 hours duration. There will be one practical paper of 50 marks. The pass marks will be 23 and examination will be of 6 hours duration in this paper.

The following will be detailed course:

Paper-I

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 2 questions will be set from group A and C each, and 5 from group B. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

SPECIAL THEORY OF RELATIVITY : **2 Questions**

Galilean transformation, inertial frame of reference, Michelson-Morley experiment, Lorentz-Fitzgerald contraction, Einstein postulates, Lorentz transformations and its consequences, length contraction and time dilation, addition of velocities, dragging of light by moving medium, relativistic Doppler effect for propagation of light waves, aberration of light, variation of mass with velocity, mass energy relation.

Group-B

MECHANICS AND PROPERTIES OF MATTER : 5 Questions

Inertial frame and non-inertial frame of reference, Coriolis and centrifugal forces and their simple applications, generalized coordinates, constraints (holonomic, non-holonomic), D'Alembert's principle and Lagrange's equations of motion, Hamilton's equation of motion and their simple applications.

Gravitational potential and fields due to bodies of regular geometrical shape, motion in central field, Kepler's laws, two particle motion in a central field.

Elasticity and elastic constants, bending of beams and cantilever, torsion of cylinder and rigidity modulus by flat spiral spring, non-flat spiral spring, effect of temperature and pressure on elasticity.

Surface tension and surface energy, principle of virtual work and its application to surface tension, ripples and gravity waves, surface tension by the method of ripples, effect of temperature and pressure on surface tension.

Perfect fluids, equation of continuity, Euler's equation for perfect fluids, Bernoulli's equation, viscosity of liquids, critical velocity, Poiseuille's formula with correction, flow of a compressible fluid through a narrow tube, viscosity of gases, Rankins method, effect of temperature and pressure on viscosity.

Group-C

SOUND: 2 Questions

Differential equation of waves, equation of progressive and stationary waves, compression waves in fluids and extended solids, free, damped and forced oscillations in one dimension, Fourier series and its applications to rectangular and saw-tooth waves, vibration of strings.

Intensity and loudness of sound and their measurement, acoustics of building.

Paper-II

Theory

Time : 3 Hours Full Marks : 75

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 4 questions will be set from group A and 5 from group

B. At least one question from group A and two from group B have to be answered. All questions will be of equal marks.

Group-A

HEAT : **4 Questions**

Derivation of Maxwell's law of distribution of velocities and its experimental verification, equilibration of energy, mean free path. Transport phenomena-viscosity, conduction and diffusion. Brownian motion-Langevin and Einstein's theories and experimental determination of Avogadro's number.

Rectilinear flow of heat in metal rod, conductivity by periodic flow method, relation between thermal and electrical conductivities, Van der Waals equation of state from virial theorem.

Group-B

THERMODYNAMICS : **5 Questions**

Zeroth law of thermodynamics, definition of temperature, first and second law of thermodynamics, Carnot's engin and Carnot's theorem, absolute scale of temperature, Classius inequality, entropy, entropy changes in reversible and irreversible process, enthalpy, Helmholtz and Gibbs function, Gibbs-Helmholtz equation, Maxwell's equations and its applications to simple physical problems.

Thermodynamic description of phase-transition, chemical potential, Latent heat of transition, Clausius-Clapeyron equation.

Joule-Thomson effect, liquefaction of gases with special reference to hydrogen and helium, production and measurement of low temperature.

Black body radiation, Kirchhoff's law, Stefan's law, Wien's law, Planck's law and its experimental verification.

Einstein and Debye theories of specific heat of solids.

PRACTICAL PAPER

Time : 6 Hours **Full Marks : 50**

The course shall include the following experiments:

1. 'g' by Kater's pendulum.
2. Young's modulus by flexure of beam.
3. Elastic constants by Searle's method.
4. Rigidity modulus by-
   (a) Barton's apparatus
   (b) Maxwell's needle.
5. Momentum of inertia of fly-wheel.
6. Surface tension by Jaeger's method.
7. Surface tension by method of ripples.
8. Surface tension of soap bubble.
9. Coefficient of viscosity of gas by Rankine's method.
10. Coefficient of viscosity of water by capillary flow method.
11. Laws of transverse vibrations by sonometer.
12. Frequency of tunning fork by Mende method.
13. Specific heat of solid by radiation correction.
14. Specific heat of liquid by cooling method.
15. Thermal conductivity of copper.
16. Thermal conductivity of Ebonite by Lee's disc method.
17. Determination of 'J' by mechanical method.
18. n of wire by dynamics method.
19. Velocity of sound by Kund's tube.

B.Sc.(Sub./Gen.) Physics Part-I

The course shall consists of one theory paper of 75 marks. The pass marks will be 23 and examination will be of 3 hours duration. There will be one practical paper of 25 marks. The pass marks will be 10 and examination will be of 3 hours duration.

The following will be detailed course:

Paper-I

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 4 questions will be set from group A and 2 from Group-B and 3 from Group-C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

RELATIVITY, MECHANICS, GENERAL PROPERTIES OF MATTER : **4 Questions**

Galilean transformation, inertial frame of reference, Michelson-Morley experiment, Lorentz-Fitzyerald contraction, Einstein postulates, Lorentz transformations and its consequences, length contraction and time dilation, addition of velocities, relativistic Doppler effect for propagation of light waves, variation of mass with velocity, mass energy relation.

Inertial frame and non-inertial frame of reference, Coriolis and centrifugal forces and their simple applications, motion in central field, Kepler's laws, generalized coordinates, constraints (holonomic, non-holonomic), Lagrange's equations of motion and their simple applications.

Elasticity and elastic constants, relation between elastic constants, bending of beams and cantilever, torsion of cylinder and rigidity modulus by flat spiral spring, effect of temperature and pressure on elasticity. Surface tension and surface energy, ripples and gravity waves, surface tension by the method of ripples, effect of temperature and pressure on surface tension.

Perfect fluids, equation of continuity, Euler's equation for perfect fluids, Bernoulli's equation.

Viscosity of liquids, critical velocity, Poiseuille's formula with correction, flow of a compressible fluid through a narrow tube, viscosity of gases, Rankins method, effect of temperature on viscosity.

Group-B

WAVES AND ACOUSTICS: **2 Questions**

Differential equation of waves, equation of progressive, stationary waves, compression waves in fluids and extended solids, free, damped and forced oscillations, Fourier analysis, vibration of string.

Intensity and loudness of sound and their measurement, acoustics of buildings, ultrasonics.

Group-C

HEAT AND THERMODYNAMICS : **3 Questions**

Maxwell's law of distribution of velocities and its experimental verification, degrees of freedom and equipartition of energy, mean free path and its experimental verification, perfect gas equation and Van der Waals equation of state, laws of thermodynamics, absolute scale of temperature, Carnot's engine.

Entropy and its calculation in simple cases, Thermodynamic relations and their applications to simple physical problems, Clausius-Clapeyron equation, Joule-Thomson effect, liquefaction of gases with special reference to helium, superfluidity of helium, Kirchhoff's law and black body radiation, , Stefan-Boltzmann law and its experimental verification.

PRACTICAL PAPER

Time : 3 Hours **Full Marks : 25**

The course shall include the following experiments:

1. 'g' by bar pendulum.

2. Young's modulus by bending of beam.

3. Momentum of inertia of fly-wheel.
4. Specific heat of solid by radiation correction.
5. Specific heat of liquid by cooling method.
6. Thermal conductivity of copper.
7. Thermal conductivity of Ebonite by Lee's disc method.
8. 'J' by Joule's calorimeter.
9. Frequency of tunning fork by Meld's experiment.
10. Surface tension by capillary tube method.
11. Elastic constants by Searle's method.
12. Rigidity modulus by Barton's apparatus
13. Rigidity modulus by Maxwell's needle.
14. Laws of transverse vibrations by sonometer.
15. Coefficient of viscosity by Poisselue's method.

B.Sc.(Hons.) Physics Part-II

The course shall consists of two theory papers-III and IV each of 75 marks. The pass marks in the two papers taken together will be 67 and examination in each will be of 3 hours duration. There will be one practical paper of 50 marks. The pass marks will be 23 and examination will be of 6 hours duration in this paper.

The following will be detailed course:

Paper-III

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 6 questions will be set from group A and 3 from group B. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

OPTICS : **6 Questions**

Fermat's principle and mirror and lens formula, cardinal points of thick lens and thick lens formula.

Interference phenomena by devision of wave front and devision of amplitude, Michelson interferometer, Fabreyperot interferometer, L.G. plate, echelon grating.

Diffraction-Fresnel's and Fraunhoffer's diffractions, half period zones, zone plate, Fresnel's diffraction at straight edge and single narrow wire, Fraunhoffer's diffraction at n slits circular aperture, plane diffraction grating, concave grating and Eagle's mounting, resolving power of prism, telescope and microscope.

Production of plane, circularly and elliptically polarized light, Nicol's prism, quarter wave plate, Babinate's compensator and analysis of elliptically polarized light, rotatory polarization and polarimeter, principle of LASER action, ruby LASER, He-Ne LASER.

Group-B

ELECTROMAGNETIC THEORY: **3 Questions**

Maxwell's field equations, Poynting vector, electromagnetic momentum, Maxwell's stress tensor, pressure and radiation, plane electromagnetic waves, reflection, refraction and total internal reflection of polarized light, double refraction in crystals, theory of dispersion, optical properties of metals and dispersion in metals, scattering by free and bound charges.

Paper-IV

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 2 questions will be set from Group-A, 4 from Group-B and 3 from Group-C. At least one question from each group to be answered. All questions will be of equal marks.

Group-A

ELECTROSTATICS, MAGNETISM : **2 Questions**

Boundary conditions at the surface of separation of two dielectrics and refraction of lines of force.

Scalar potential in electrostatics, the potential of system of charges, dipole and quadrupole moment, energy stored in an electrostatic field, Poisson's and Laplace's equation in Cartesian, polar and cylindrical coordinates and their solutions for simple geometrics, dielectric polarisation, relation between $\mathbf{D}$, $\mathbf{E}$ and $\mathbf{P}$.

Properties of ferromagnetic material, hysteresis curve, method for obtaining $B-H$ curve, energy loss per cycle of magnetisation, magnetic flux density (B) by (a) B.G. and search coil (b) Grassot fluxmeter. Energy stored in a magnetic field, measurement of susceptibility of liquid by quincke's method, Langevin's and Weiss theories of dia, para and ferromagnetism.

Group-B

CURRENT ELECTRICITY : **4 Questions**

Thermodynamic treatment of Seebeck, Peltier and Thomson effects and their applications, self inductance and mutual inductance, growth and decay of current in circuits containing L, C and R, simple applications of these circuits, moving coil galvanometer, aperiodic and ballistic galvanometer, A.C. and A.C. circuits, use of vectors and complex numbers in A.C. circuit theory, series and parallel resonant circuits, power in A.C. circuits, Wattmeter, A.C. Bridges (i) De Sauty bridge (ii) Anderson bridge (iii) Carey Foster bridge (iv) Scheing bridge. Three phase A.C. systems, mutually coupled circuits, rotating magnetic fields, polyphase and single phase induction motors, the transformer- equivalent circuit and vector diagram, iron and copper losses in transformer.

Group-C

MODERN PHYSICS : **3 Questions**

Measurement of charge by Millikan's method and specific charge of an electron by Thomson's method, natural radioactivity, Rutherford- Soddy's theory of radioactive decay, Geiger-Muller counter, discovery of neutron, isotopes, artificial radioactivity, elementary ideas about nucleus and its structure, nuclear fission reactors, Aston's mass spectrograph, cyclotron and betatron.

Photoelectric emission, Einstein's photoelectric equation, photoconductive and photovoltaic cells, Compton effect.

Cathode ray oscilloscope and its uses in amplitude, frequency and phase measurement, solid-state rectifier and one stage $R-C$ amplifier.

Primary and secondary cosmic rays, penetrating components of cosmic rays, altitude and latitude variation of cosmic ray intensity, E-W asymmetry, cosmic ray showers, Rossi curves, outline of cascade theory, origin of cosmic rays.

PRACTICAL PAPER

Time : 6 Hours **Full Marks : 50**

The course shall include the following experiments:

1. Magnifying power of Telescope.
2. Magnifying power of Microscope.
3. Angle of dip by-
   (a) Dip circle
   (b) Earth's inductor.
4. Wavelength by Newton's ring.
5. Refractive index by spectrometer.
6. Wavelength of monochromatic light using Biprism.
7. Characteristics of a semiconductor diode.
8. Specific rotation by polarimeter.
9. Figure of merit of a suspended coil galvanometer.
10. Measurement of wavelength of monochromatic light by plane transmission grating using spectrometer.
11. Measurement of wavelength of monochromatic light using optical bench.
12. Resolving power of telescope.
13. Calliberation of ammeter and voltmeter by potentiometer.
14. Compare the capacities of capacitors by De Sauty' bridge.
15. B.G. constant by decrement method.
16. Measurement of low and high resistance.
17. Figure of merit of ballistic galvanometer.
18. Design and study of single stage $R-C$ coupled amplifier.

B.Sc.(Sub./Gen.) Physics Part-II

The course shall consists of one theory paper of 75 marks. The pass marks will be 23 and examination will be of 3 hours duration. There will be one practical paper of 25 marks. The pass marks will be 10 and examination will be of 3 hours duration.

The following will be detailed course:

Paper-II

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 2 questions will be set from Group-A, 4 from group B and 3 from Group-C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

ELECTROSTATICS AND MAGNETISM: **2 Questions**

Boundary conditions at the surface of separation of two dielectrics, electric dipoles, dipole moment, dielectric polarisation, electrical images, problems involving conducting plane and thin conducting spherical shell only.

Magnetic shell, Langevin's and Weiss theories of dia, para and ferromagnetism, Curie law, production and measurement of strong magnetic fields, magnetic circuits and electromagnets.

Group-B

CURRENT ELECTRICITY, MODERN PHYSICS : **4 Questions**

Thermodynamic treatment of Seebeck, Peltier and Thomson effects and their applications,moving coil aperiodic and ballistic galvanometer, growth and decay of current in electrical circuit, oscillatory discharge of condenser.

A.C. and A.C. circuits, use of vectors and complex numbers in A.C. circuits theory (LR, CR and LCR circuits), De Sauty bridge, Anderson bridge, Carey Foster bridge.

Measurement of charge by Millikan's method and specific charge of an electron by Thomson's method, natural radioactivity, Rutherford- Soddy's theory of radioactive decay, Geiger-Muller counter, discovery of neutron, isotopes, artificial radioactivity, elementary ideas about nucleus and its structure, nuclear fission reactors, Aston's mass spectrograph.

Photoelectric emission, Einstein's photoelectric equation, photoconductive and photovoltaic cells, Compton effect.

Cathode ray oscilloscope and its uses in amplitude, frequency and phase measurement, solid-state rectifier and one stage $R-C$ amplifier, principle of amplitude modulation and demodulation, radio receiver through block diagram.

Group-C

OPTICS : **3 Questions**

Fermat's principle, Newton's ring, Michelson interferometer,Fresnel's diffraction at straight, Fraunhoffer's diffraction, single slit, double slit, plane transmission grating, resolving power of telescope and microscope, polarisation, Production of plane, circularly and elliptically polarized light, Nicol's prism, quarter wave plate,half shade polarimeter, Babinate's compensator.

Bohr's theory of hydrogen spectra, principle of LASER action, ruby LASER, Maxwell's equation, equation of plane electromagnetic waves and its simple solution.

PRACTICAL PAPER

Time : 3 Hours **Full Marks : 25**

The course shall include the following experiments:

1. Magnifying power of Telescope.
2. Angle of dip by circle.
3. Wavelength by Newton's ring.
4. Refractive index by spectrometer.
5. Measurement of wavelength of monochromatic light by plane transmission grating.

6. Measurement of low resistance.
7. Measurement of high resistance.
8. Figure of merit of moving coil galvanometer.
9. Measurement of angle of prism by spectrometer.
10. Angle of dip by earth inductor.
11. Resolving power of Telescope.
12. Magnifying power of microscope.
13. Calliberation of ammeter and voltmeter by potentiometer.
14. Study of characteristics of a given semiconductor diode.
15. Compare the capacities of capacitors by De Sauty' bridge.

B.Sc.(Hons.) Physics Part-III

The course shall consists of three theory papers-V, VI and VII each of 100 marks. The pass marks in the three papers taken together will be 135 and examination in each will be of 3 hours duration. There will be two practical papers VIIIA and VIIIB each of 50 marks and 6 hours duration. marks. The pass marks taken together will be 45.

The following will be detailed course:

Paper-V

Theory

Time : 3 Hours **Full Marks : 100**

10 questions to set, 5 to be answered. Question number one will be objective (20 Questions) and it will be compulsory. 3 questions will be set from each group A, B and C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

MATHEMATICAL PHYSICS : **3 Questions**

Curvilinear coordinates, Cartesian, spherical, polar and cylindrical coordinates, orthogonal transformations of coordinates, scalar, vector, scalar and vector fields, divergence and curl, line, surface and volume integrals, theorem of Gauss, Stokes and Green, tensor and its elementary properties, partial differential equations and its solution by separation of variables, Laplace's equation and its solution, wave equation and its solution, Poisson's equation and its solution, function of complex variable, Cauchy-Rieman equation, zeros and poles, Taylor and Laurent's theorems, Cauchy's integral theorem, residue theorem, integration of complex functions.

Group-B

CLASSICAL MECHANICS : **3 Questions**

Hamilton's principle, Euler-Lagrange's equation, principle of least action, conservation theorems and symmetry properties, application of Hamiltonian, dynamics to simple problem-charged particle in an electromagnetic field (non-relativistic cases),laws of motion of rigid

body, moment of inertia and products of inertia, Eulerian angle, Euler's equation of motion of a rigid body, gyroscopic motion, motion of symmetrical top, canonical transformation, examples of canonical transformation, canonical transformation and Hamilton-Jacobi equation, action angle variables.

Group-C

QUANTUM MECHANICS : **3 Questions**

Inadequacy of classical mechanics, dual nature of matter and radiation, De Broglie concept, the correspondence principle, postulates of quantum mechanics, eigen functions and eigen values of Hamilton's operators, uncertainty relations.

Schrodinger wave equation and physical meaning, its applications to problems of free particle, transmission of particle through potential step, one dimensional square well particle in a box, linear harmonic oscillator, rigid rotator, hydrogen atom, commutation rules of orbital angular momentum, their eigen functions and eigen values, spin half angular momentum, Pauli's spin matrices, Pauli spin operators, symmetric and antisymmetric wave functions, Pauli's exclusion principle.

Paper-VI

Theory

Time : 3 Hours **Full Marks : 100**

10 questions to set, 5 to be answered. Question number one will be objective (20 Questions) and it will be compulsory. 4 questions will be set from Group-A, 2 from Group-B and 3 from Group-C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

STATISTICAL PHYSICS : **4 Questions**

The fundamental assumptions of statistical mechanics, probability distribution and entropy, partition function and its conversion to thermodynamic functions, SackurTetrode equation and Gibbs paradox.

Elements of ensemble theory and Liouville's theorem, canonical ensembles and thermodynamic energy fluctuations in the canonical ensemble, grand canonical ensemble and thermodynamic density fluctuations in the grand canonical ensemble, simple application of ensemble theories to perfect gas.

Boltzmann distribution, Fermi-Dirac distribution, Bose-Einstein distribution and their simple application, radial distribution function and its relation to thermodynamic functions, a brief introduction to first and second order phase-transition, critical exponents, Ising model in zeroth approximation, introduction to fluctuations, the probability of thermodynamic fluctuations.

Group-B

ELECTRONICS : **2 Questions**

Thermionic-Richardson equation and its experimental verification, Child-Langmuir equation, Schottky effect, semiconductor devices, p-n junction and Zener diode, BJT and FET transistors, opto-electrical devices, photo devices, LDR photo voltaic cell, photo transistor.

CIRCUIT THEORY : Coupled LCR circuits, superposition theorem, Thevenin and reciprocity theorems, maximum power transfer theorem, one part and two port network (only h-parameter), T and Pi equivalence of two port network, Ladder network and constant K filters (low, high and bandpass, attenuators.

Group-C

SOLID STATE ELECTRONIC CIRCUIT : **3 Questions**

Equivalent circuit of BJT and FET, half wave and full wave rectifiers, power supply with specific reference to smoothing circuits and voltage stabilization by cold cathode valve and Zener diode, A.F. amplifier (RC coupled amplifiers), feedback amplifiers, pushpull power amplifier, simple circuits for oscillation, LC (Hartley and Colpitts) oscillator, RC oscillator, astable multivibrator, principle of amplitude modulation, amplitude modulator average and envelop detection, radio receiver, super hetrodyne receivers, simple idea of transmitters (with block diagrams), CRO and its application, LOGIC circuits, AND, OR, NAND, NOR operations with the help of simple logic gates, types of computers and their basic components, input output devices, concept of hardware and software, BITS and BYTES computer programming of some simple mathematical problem in BASIC and FORTRAN languages.

Paper-VII

Theory

Time : 3 Hours **Full Marks : 100**

10 questions to set, 5 to be answered. Question number one will be objective (20 Questions) and it will be compulsory. 3 questions will be set from each Group-A, B and C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

PLASMA AND CLASSICAL ELECTRODYNAMICS : 3 Questions

Microscopic and macroscopic properties of plasma, plasma oscillation, Debye's potential, wave propagation in isotropic plasma, ionospheric reflection, pinch effect, Alfven wave, Shaha's theory of ionisation, retarded and advanced potential, field due to an oscillating current element, oscillating dipole, Linard-Wiechert potential, potential and field due to uniformly moving charge, covariance of Maxwell's equations under Lorentz transformation, transformation equation for electromagnetic fields.

Group-B

SOLID STATE PHYSICS : 3 Questions

Elements of crystallography, Bravais lattice, Miller indices, seven crystal system, simple crystal structure of $NaCl$, $Cacl_2$ and diamond, interaction of X-rays, neutron and electron with diffraction of X-rays from a perfect crystal, Bragg's law, reciprocal lattice, Ewald construction and Brillouin zone.

Crystal binding, ionic, metallic, covalent and Van der Waal binding, Van der waal-London interaction and cohesive energy of inert gas crystal, Modelung energy and Modelung constant.

Free electron theory of metals, heat capacity of electron gas, electrical conductivity of metals, Boltzmann-transport equation, Sommerfeld theory of electrical conductivity, band theory of solids.

Bloch theorem, Kronig-Penney model, distinction between metal, semiconductor and insulator, intrinsic and extrinsic semiconductors, transistors, p-n junction, rectifier, Hall-effect.

Group-C

ATOMIC AND NUCLEAR PHYSICS : **3 Questions**

Origin of atomic spectra, Bohr's theory and Bohr-Sommerfeld theory of hydrogen atom, spectra of alkali and alkaline earth metals, selection rules, excitation potential, fine structure, Stern-Gerlach experiment, vector model of atom, Zeeman effect and Paschen-Back effect of single valence atom, Moseley's law, origin of X-rays spectra.

Rotational vibration spectra of diatomic molecules, rotation, vibration and electronic bands, introduction to NMR, ESR, LASER spectroscopy, general properties of nuclear mass, charge, spin, static magnetic moment, size and stability, nuclear models, liquid drop model and mass formula, the shell model, classical theory of Rutherford scattering.

Paper-VIII(A)

PRACTICAL PAPER

Time : 6 Hours **Full Marks : 50**

The course shall include the following experiments:

1. Junction diode characteristics.
2. Zener diode characteristics.
3. FET characteristics.
4. BJT characteristics (Common base).
5. BJT characteristics (Common emitter).
6. BJT characteristics (Common collector).
7. Frequency response of RC amplifier.
8. Effect of negative feedback of RC amplifier.
9. Properties of Hartley's oscillator.
10. study of logic gates (AND, NAND, OR, NOR).

11. Verify the Child-Langmuir law.

12. Study the load characteristic of rectifier.

13. Study the plane modulated wave.

14. Multivibrator and study of its waveform.

15. Design and study of power supply.

Paper-VIII(B)

PRACTICAL PAPER

Time : 6 Hours **Full Marks : 50**

The course shall include the following experiments:

1. Verification of Brewster's law.

2. Verification of Fresnel's law of reflection and refraction of polarized light.

3. Analysis of elliptically polarised light a Babinet compensator.

4. inductance of coil by Anderson's bridge.

5. Mutual inductance by Carey-Foster bridge.

6. Frequency characteristic of low pass filter.

7. e/m by Braun's tube and high pass filter.

8. e/m by helical method.

9. Planck's constant by photocell method.

10. Power factor of A.C. fan by-

    (a) Three ammeter method

    (b) Three voltmeter method.

11. e/m by Millikan's oil drop method.

12. Phase shift measurement using oscilloscope.

13. Measurement of band gap of given semiconductor.

14. A comparative study of series and parallel resonant circuits and

    (a) Measurement of 'Q' of the circuit

    (b) Measurement of 'L', C and R.

15. Study of resonance in series LCR circuit.

B.Sc.(General) Physics Part-III

The course shall consists of one theory papers of 75 marks. The pass marks will be 23 and examination will be of 3 hours duration. There will be one practical papers of 25 marks. The pass marks will be 10 and examination will be of 3 hours duration.

The following will be detailed course:

Paper-III

Theory

Time : 3 Hours **Full Marks : 75**

10 questions to set, 5 to be answered. Question number one will be objective (15 Questions) and it will be compulsory. 2 questions will be set from Group-A, 4 from Group-B and 3 from Group-C. At least one question from each group is to be answered. All questions will be of equal marks.

Group-A

QUANTUM MECHANICS : **2 Questions**

Need of quantum mechanics, dual nature of matter and radiation, De Broglie relation, uncertainty principle, postulates of quantum mechanics, Schrodinger wave equation and its applications to problems of

1. Particle in a box
2. Particle in one dimensional square well
3. Transmission across a potential barrier
4. Linear harmonic oscillator.

Group-B

SOLID STATE PHYSICS : **4 Questions**

Crystal structure, Bravais lattice, Miller indices, simple crystal structure of $NaCl$, $Cacl_2$, Crystal binding, ionic, metallic, covalent and Van der Waal binding.

London interaction and cohesive energy of inert gas crystal, Modelung energy and Modelung constant.

FREE ELECTRON : Free electron theory of metals, heat capacity of electron gas, electrical conductivity of metals, band theory of solids, Bloch theorem, distinction between metal, semiconductor and insulator, intrinsic and extrinsic semiconductors, transistor and p-n junction rectifier, electrical polarisation and displacement in materials, local electric field in an atom, dielectric constant and polarisation, Langevin Debye equation.

THERMIONICS : Richardson equation and its experimental verification, Child-Langmuir equation, Schottky effect, semiconductor devices, p-n junction and Zener diode, BJT and FET transistors, opto-electrical devices, photo devices, LDR photo voltaic cell, photo transistor.

CIRCUIT THEORY : Coupled LCR circuits, superposition theorem, maximum power transfer theorem, one port and two port network (only h-parameter), T and Pi equivalence of two port network, Ladder network.

Group-C

SOLID STATE ELECTRONIC CIRCUITS : 3 Questions

Equivalent circuit of BJT and FET, half wave and full wave rectifiers, power supply with specific reference to smoothing circuits and voltage stabilization by cold cathode valve and Zener diode, A.F. amplifier (RC coupled amplifiers), feedback amplifiers, pushpull power amplifier, RC oscillator, astable multivibrator, solid state amplitude modulator, LOGIC circuits, AND, OR, NAND, NOR operations with the help of simple logic gates.

Types of computers and their basic components, input output devices, concept of hardware and software.

PRACTICAL PAPER

Time : 3 Hours **Full Marks : 25**

The course shall include the following experiments:

1. Junction diode characteristics.

2. Zener diode characteristics.

3. FET characteristics.

4. BJT characteristics (Common base).

5. BJT characteristics (Common emitter).

6. Frequency response of RC amplifier.

7. study of logic gates (AND, OR, NOR).

8. e/m by helical method.

RECOMMENDED TEXTBOOKS

List of some standard textbooks for B.Sc.(Hons.) Physics papers

- Paper-I & II

  1. Mechanics by D.S. Mathur.
  2. Introduction to Special Relativity: Robert Resnick.
  3. The Physics of Waves and Oscillations: N.K. Bajaj.
  4. Heat and Thermodynamics: Brij Lal and N. Subramanyam.
  5. A Treatise on Heat: M.N. Saha and B.N. Srivastava.
  6. Heat and Thermodynamics: K.W. Zeemansky.

- Paper-III & IV

  1. A textbook of Optics: N. Subrahmanyam, Brijlal and M. N. Avadhanulu.
  2. Optics: Ajoy Ghatak
  3. Introduction to Electrodynamics: David J. Griffiths.
  4. Electronic devices : T.L. Floyd
  5. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit.
  6. Modern Physics: K.S. Krane.
  7. Elementary Modern Physics: A.P. Arya.
  8. Concepts of Modern Physics: Arthur Beiser

- Paper-V

  1. Mathematical Methods in Physical Sciences: Boas.
  2. Mathematical Methods for Physicists: Arfken and Weber.
  3. Schaum's Outline of Complex Variables, 2ed: Murray R. Spiegel
  4. Mathematics for Physicists and Engineers: Pipes.
  5. Introduction to Classical Mechanics: R. G. Takwale and Puranik.
  6. Classical Mechanics of Particles and Rigid Bodies: K. C. Gupta.

7. Classical Mechanics: H. Goldstein.
8. Classical Mechanics: J.C. Upadhyay.
9. Quantum Mechanics: D.J. Griffiths
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