

B.Sc.(Physics) Part-I (1st and IInd Semester)
SCHEME

SESSION 2011-12, 2012-13, 2013-14

	TITLE OF PAPER	MAX MARKS	NO OF LECTURES
SEMESTER -I			
Paper A	Mechanics-I	40	40
Paper B	Mechanics-II	40	40
Paper C	Electricity and Magnetism-I	40	40
	Practicals	30	80
SEMESTER -II			
Paper A	Vibrations and Waves-I	40	40
Paper B	Vibrations and Waves-II	40	40
Paper C	Electricity and Magnetism-II	40	40
	Practicals	30	80

General Instructions

- 1) There will be three papers of theory and one laboratory(practical) course.
- 2) The number of lectures per week will be three for each theory paper.
- 3) The number of lectures per week will be six for practicals.
- 4) The examination time for each theory will be 3 hours.
- 5) The examination time for practical will also be 3 hours.
- 6) The use of non programmable calculator will be allowed in the examination centre but this will not be provided by the University/College.
- 7) Each theory paper will consist of three sections A,B and C . Section C is compulsory
- 8) Use of scientific non programmable calculator is allowed in practicals also.

SECTION A

There will be four questions . Each question will carry eight marks. Two question are to be attempted

SECTION B

Similarly there will be four questions . Each question will carry eight marks. Two question are to be attempted.

SECTION C

There will be eight questions of short answer type covering the whole syllabi. Each question will carry one mark.

Semester -I

PAPER A: MECHANICS-I

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three Sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Cartesian and spherical polar co-ordinate systems, area, volume, displacement, velocity and acceleration in these systems, Solid angle, Various forces in Nature(brief introduction) Centre of mass, Equivalent one body problem, Central forces, Equation of motion under central force, Equation of orbit in inverse square, Force field and turning points, Kepler laws and their derivations.

SECTION B

Relationship of conservation laws and symmetries of space and time. Inertial frame of reference. Coriolis force and its applications. Variation of acceleration due to gravity with latitude. Foucault pendulum(qualitative). Elastic collision in Lab and C.M.system, velocities, angles and energies, Cross section of elastic scattering . Rutherford scattering (qualitative).

TEXT BOOKS:

1. Mechanics : Berkeley Physics Course, vol. I by C.Kittel, W.D.Knight and M.A.Ruderman, Mc Graw-Hill Publication
2. Mechanics : H.S.Hans and S.P.Puri, T.M.H.Pub.

Semester -I

PAPER B: MECHANICS-II

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three Sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Rigid body motion: Rotational motion, principal moments and axes. Euler's equations; precession and elementary gyroscope. Galilean transformation and Invariance, Non-Inertial frames, concept of stationary universal frame of reference and ether. Michelson-Morley experiment and its result.

SECTION B

Postulates of special theory of relativity. Lorentz transformations, Observer and viewer in relativity. Relativity of simultaneity. Length, Time, Velocities, Relativistic Doppler effect. Variation of mass with velocity, mass-energy equivalence, rest mass in an inelastic collision, Relativistic momentum and energy, their transformation, concepts of Minkowski space, four vector formulation.

TEXT BOOKS:

1. Mechanics:-Berkeley Physics Course, vol. I by C.Kittel, W.D.Knight and M.A.Ruderman, Mc Graw-Hill Publication
2. Mechanics :-H.S.Hans and S.P.Puri, T.M.H.Pub.

Semester-I

PAPER C: ELECTRICITY AND MAGNETISM-I

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three Sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Basic ideas of vector calculus, Gradient, Divergence, curl and their physical significance, Laplacian in rectangular and spherical polar co-ordinate. long uniformly charged wire, Charged disc. Stokes's theorem and its applications in electrostatic field, $\text{curl } \mathbf{E} = 0$. Electric field as gradient of scalar potential. Calculation of \mathbf{E} due to a point charge and dipole from potential. Potential due to arbitrary charge distribution and multipole moments. Poisson and Laplace's equations and their solutions in cartesian and concept of electrical images.

SECTION B

Calculation of electric potential and field due a point charge placed near an infinitely conducting sheet. Current and current density, equation of continuity. Microscopic form of Ohm's Law. ($\mathbf{J} = \dots \mathbf{E}$) and conductivity. Failure of Ohm's Law. Invariance of charge. \mathbf{E} in different frames of reference. Field of a point charge moving with constant velocity. Interaction between moving charges and force between parallel currents.

TEXT BOOKS

1. Fundamentals of Electricity and Magnetism by Author F.Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol.II by E.M.Purcell, McGraw-Hill, 1965.
3. Introduction to Classical Electrodynamics by David Griffith.
4. EM Waves and Radiating Systems by Edward C.Jordan and K.G.Balmain.

Semester -II

PAPER A: VIBRATIONS AND WAVES-I

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Simple harmonic motion, energy of a SHO. Compound pendulum, Electrical oscillations. Transverse vibrations of a mass on a string, composition of two perpendicular SHM of same period and of period ratio 1 : 2. Anharmonic oscillations. Decay of free vibrations due to damping. Differential equation of motion, types of damping. Determination of damping co-efficient-logarithmic decrement, relaxation time and Q-Factor. Electromagnetic damping (Electrical oscillator)

SECTION B

Differential equation for forced mechanical and electrical oscillators. Transient and steady state oscillation. Displacement and velocity variation with driving force frequency, variation of phase with frequency resonance, Power supplied to an oscillator and its variation with frequency, Q value of a

TEXT BOOKS

1. Fundamentals of Vibrations and Waves by S.P.Puri, Tata McGraw Hill, New Delhi.
2. Physics of Vibrations and Waves by H.J.Pain.
3. EM Waves and Radiating Systems by Edward C.Jordan and K.G.Balmain.

REFERENCE BOOKS

1. Waves and Oscillations, E.Crawford, Berkeley Physics Course, McGraw-Hill Publications.
forced oscillator and band width. Q-value as an amplification factor of low frequency response.

Semester -II

PAPER B: VIBRATIONS AND WAVES-II

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three Sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Stiffness coupled oscillators. Normal co-ordinates and normal modes of vibration. Inductance coupling of electrical oscillators, Types of waves, Wave equation (transverse) and its solution, The string as a forced oscillator, Characteristic impedance of a string. Impedance matching. Reflection and transmission of energy, Reflection and Transmission Energy, Reflection and transmission of string, wave and group velocity. Standing waves on a string of fixed length. Energy of vibrating energy string, wave and group velocity.

SECTION B

Physical interpretation of Maxwell's equations. Electromagnetic waves and wave equation in a medium having finite permeability and permittivity but with conductivity $\sigma = 0$. Poining vector. Impedance of a dielectric to EM waves, EM waves in a conducting medium and skin depth. EM waves velocity in a conductor an anomalous dispersion. Response of a conducting medium of EM waves. Reflection and transmission of EM waves at a boundary of two dielectric media for normal incidence. Reflection of EM waves from the surface of a conductor at normal incidence.

TEXT BOOKS

1. Fundamentals of Vibrations and Waves by S.P.Puri, Tata McGraw Hill, New Delhi.
2. Physics of Vibrations and Waves by H.J.Pain.
3. EM Waves and Radiating Systems by Edward C.Jordan and K.G.Balmain.

REFERENCE BOOKS

1. Waves and Oscillations, E.Crawford, Berkeley Physics Course, McGraw-Hill Publications.

Semester-II

PAPER C: ELECTRICITY AND MAGNETISM-II

Maximum Marks: 40
Pass Marks: 35 %

Time Allowed: 3 Hours
Total Teaching hours: 40

Instruction for the Paper Setter

The question paper will consist of Three sections.: A, B and C . There will be four questions from Sections A and B each and each question will carry 08 marks. Section C will consist of one compulsory question having eight parts of short answer type covering the whole syllabi. Each part will carry one mark.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from Section A and B of the question paper. Section C is compulsory.
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Behaviour of various substances in magnetic field. Definition of M and H and their relation to free and bound currents. Permeability and susceptibilities and their inter-relationship. Orbital motion of electrons and diamagnetism. Electron spin and paramagnetism. Ferromagnetism. Domain theory of Ferromagnetism. Hysteresis Loss. Magnetisation curve Ferrites.

SECTION B

Lorentz's force. Definition of B, Biot Savart's Law and its applications to long straight wire, circular current loop and solenoid. Ampere's Circuital law and its application. Divergence and curl of B. Hall effect, expression and co-efficient. Vector potential, Definition and derivation of current density and its use in calculation of change in magnetic field at a current sheet. Transformation equations for E and B from one frame to another. Faraday's Law and EM induction. Displacement current. Maxwell's equations. Mutual inductance and reciprocity theorem. Self inductance L for solenoid. Coupling of Electrical circuits. Analysis of LCR series and parallel resonant circuits. Q-factor. Power consumed Power factor.

TEXT BOOKS

1. Fundamentals of Electricity and Magnetism by Author F.Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol.II by E.M.Purcell, McGraw-Hill, 1965.
3. Introduction to Classical Electrodynamics by David Griffith.
4. EM Waves and Radiating Systems by Edward C.Jordan and K.G.Balmain.

B.Sc. (Physics)

General Guidelines for Physics Practical Examination.

Total Marks: 30

1. The student will be asked to perform one experiment out of the experiments mentioned in the syllabus.
2. The distribution of marks is as follows :
 - (i) One full experiment requiring the student to take some data, analyse it and draw conclusions-(candidates are expected to state their results with limits of error. (15)
 - (ii) Brief theory (05)
 - (iii) Viva-Voce (05)
 - (iv) Record(Practical File) (05)
3. There will be one session of 03 hours duration. The paper will consist of 08 experiments out of which an examinee will mark 06 experiments and one of these is to be allotted by the external examiner.
4. Number of candidates in a group for practical examination should not exceed 12.
5. In a single group no experiment be allotted to more than three students in any group.
6. The student should determine Std Deviations and probable error in the calculations where as needed.

Practical Semester-I

(80 Hours)

1)	Analysis of experimental data by : i) Fitting of given data to a straight line. ii) Calculation of probable error.
2)	To establish relationship between torque and angular acceleration using fly wheel and hence to find inertia of flywheel.
3)	To determine the Young's Modulus by bending of beam.
4)	To study one-dimensional collision using two hanging spheres of different materials.
5)	Determination of Poisson's ratio for rubber.
6)	Study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations) using objects of various geometrical shapes but of same mass.
7)	Study the flow of water through capillary tubes of different lengths and area of cross section and to calculate the co-efficient of viscosity.
8)	Study the dependence of solenoidal field on number of turns and current.
9)	To study the magnetic field produced by a current carrying solenoid using a search coil and to find the value of permeability of air.
10)	To determine the value of air capacitance by de-Sauty method and to find the permittivity of air and also to determine the dielectric constant of medium.

11)	To study the efficiency of an electric kettle/heater element with varying input voltages.
12)	To study the working of energy meter.
13)	Elementary FORTRAN programs, Flowchart and their interpretation.
14)	To print out all natural even-odd numbers between given limits.
15)	Numerical solution of equation of motion.
16)	Motion of particle in a central force field.

TEXT AND REFERENCE BOOKS

1.	Mechanical Systems by B.Saraf et al.
2.	A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal
3.	Computer programming by R.C.Verma, V.K.Mittal and S.C.Gupta (Vishal Publication, Jalandhar) , 2003.
4.	Fortran 77 and Numerical Methods by C.Xavier, (New Age Publication, Delhi), 1996.
5.	Computer Oriented Numerical Methods, V.Rajaraman, Prentice Hall of India, New Delhi, 1990.

Practical Semester II

(80hours)

1	To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine i) Radius of gyration of bar pendulum about an axis through its C.G. and perpendicular to its length. ii) the value of g.
2	Determination of g by Kater's pendulum.
3	Determination of modulus of rigidity of material of a wire using Maxwell's needle.
4	Measurement for logarithmic decrement, co-efficient of damping, relaxation time and quality factor of a damped simple pendulum.
5	To determine the frequency of AC mains using a sonometer and an electro magnet.
6	To plot lissajous figures and determine phase angle by CRO.
7	To determine the low resistance using Carey Foster Bridge.
8	Determination of unknown capacitance by flashing and quenching of neon lamp.
9	Study the phase relationships between voltage and current using impedance triangle.

10	To study the resonance in series and parallel LCR circuits for different resistances and calculate Q-value.
11.	To determine the given inductance by Anderson's bridge.
12.	Verify laws of electromagnetic induction.
13.	To study the induced emf as function of velocity.
14.	To find maximum, minimum and range of a given set of numbers.
15.	To compile a frequency distribution and evaluate moments such as mean: standard deviation etc.
16.	To evaluate sum of finite series and the area under a curve.

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1.	Mechanical Systems by B.Saraf et al.
2.	A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal
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