

## 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 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%	Of the aggregate prescribed at (a) part First Examination excluding those obtained in the Compulsory subject (b) part second Examination Taken together.
Second Division	48%	

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 I and Part II Examinations.

### 1. B.Sc, Part II Physics

Paper I	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper II	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper III	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Practical	Exam. 5 Hours Duration	Max. Marks 50	Min. Pass Marks 18

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

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

**Examination Duration: 3 Hrs.**

**Scheme of Examination:** Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any 9 questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% 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, 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 relation and their applications.

## Unit-2

**Production of low temperatures and applications:** Joule Thomson expansion and JT 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:

**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, the principle of equal partition of energy.

## Unit -3

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

**Classical Statistics :** Validity of Classical approximation micro and macro states, Thermodynamic probability. relation between entropy and thermodynamic probability, Monoatomic ideal gas, Barometric equation.

## Unit - 4

**Quantum Statistics:** Bose-Einstein statistics and its distribution function: Planck distribution function and radiation formula, Fermi-Dirac statistics and its distribution function, contact potential thermionic emission.

### Reference Books:

1. Treatise on heat by Shah & Srivastave.
2. Thermodynamics by DP Khandelwal.
3. Heat & Thermodynamics - Brijlal Subramaniam

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

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

**Examination Duration: 3 Hrs.**

**Scheme of Examination:** Five questions shall be set and all are compulsory First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any 9 questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% 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, contravariant and mixed tensor, Addition, multiplication and contraction of tensors, Dirac delta function and its properties

## UNIT-2

Lorentz transformation and rotation in space-time.

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.

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 Legendre's differential equations. Basic properties like orthogonality, recurrence relation, graphical representation and generating function of Associated Legendre function (simple applications).

## UNIT-4

Techniques or separation of variables and its application to following boundary value problems (I) Laplace equation in three dimensional Cartesian coordinate system - line charge between two earthed parallel plates (II) Wave equation in spherical polar coordinates the vibrations of a Circular membrane, (III) Laplace equation in spherical coordinate system-electric potential around a spherical surface.

### Reference Books:

1. Mathematical Physics – Satyaprakash.
2. Mathematics for physics & Engee Pipes & Horwill.
3. Mathematical Physics - B.S Rajput

### Paper III: Electronics and Solid State Devices

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

**Examination Duration: 3 Hrs**

**Scheme of Examination:** Five questions shall be set and all are compulsory First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words Candidates

have to attempt any ten questions out of these 12 questions Remaining four questions will be of 6 marks each and will best with one question from each unit Second to fifth questions will have 100% internal choice

### Unit I

#### Circuit analysis and PN junctions

Circuit analysis Networks- some important definitions, loop and nodal equation based on DC and AC circuits (Kirchhoff's Laws). Four terminal network Ampere volt conventions, open, close and hybrid parameters of any four terminal network. Various circuit theorems. Superposition, Thevenin Norton, reciprocity. Compensation, maximum power transfer. PN junction : Charge densities in N and P materials conduction by drift and diffusion of charge carriers PN diode equation.

### 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 T-section filters. Voltage regulation : Voltage regulation and voltage stabilization by Zener diode, voltage multiplier.

**Transistors:** Notions 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 (JEFT) and metal oxide semiconductor field effect transistor (MOSFET).

### 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, basis idea of direct coupled and RC coupled amplifiers, Differential amplifiers, Amplifier with feedback : Concept of feedback, positive and negative.

Voltage and current feedback circuits. Advantage of negative feedback : Stabilization of gain; effect of negative feedback on output and input resistance, reduction on nonlinear distortion, effect on gain – frequency response.

## Unit 4

### Oscillators and Logic Circuits

**Oscillators:** criteria for self-excited and self-sustained oscillation, circuit requirement for buildup of oscillation, basic transistor oscillator circuit and its analysis, Colpitt's and Hartely Oscillator, RC Oscillators.

**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:

1. John D. Ryder. Electronic Fundamentals and Applications, Prentice Hall of India Pvt. Ltd, New Delhi
2. John D. Ryder. Engineering Electronics, McGraw Hill Book Company, New Delhi.
3. Jacob Millman and Christosc Hailkias, Integrated ' Electronics. Analog and Digital. Circuits and systems McGraw Hill Ltd:(1972).
4. Albert Paul Malvino, Digital Computer Electronics. TataMcGraw- Hill-Pub. Co. Ltd., New Delhi (1983).
5. Kumar & Gupta Hand book of Electronics,
6. GK. Mithal, Hand Book of Electronics.
7. GK Mithall Electronics Devices and Applications:
8. RP Jain. Digital Electronics.

### PRACTICAL

Teaching 1 hrs/week

Min Pass Marks. 18

Examination Duration. 5hrs.

Max Pass Marks: 50

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

(Perform any Six experiments for the session 2020 -21).

### Section-A

1. Study of dependence of velocity of wave propagation on line parameter using torsional wave apparatus.
2. Study of variation or 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 wavelength of sodium light using grating.
8. To determine wavelength of sodium light using Biprism.
9. Determine the thermodynamic constant  $\gamma = C_p/C_v$  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 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.
3. Study of half wave rectifier using single diode & application of L and/or 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 ( $\cos \theta$ ) 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.
10. Measurement of inductance of a coil by Anderson's bridge.
11. Measurement of capacitance and dielectric constant of a liquid and gang condenser by de-Sauty bridge.

**Blue print for setting question paper I & II for B.Sc. part I Physics Examination - 2018**

First question is compulsory and is of 10 marks. This question contains 12 short answer type questions of one mark each. Candidates have to attempt any 10 questions with answer not more than 50 words. Second to fifth questions are of six marks each with internal choice.

प्रथम प्रश्न अनिवार्य है और यह 10 अंक का है। इस प्रश्न के अन्तर्गत 12 लघुत्तरात्मक प्रश्न हैं जिनमें से कोई भी 10 प्रश्न हल करने हैं जिनका उत्तर 50 शब्दों से अधिक न हो। प्रश्न संख्या 2 से 5 तक प्रत्येक प्रश्न 6 अंक का है जिसमें आन्तरिक विकल्प है।

1. पचास शब्द सीमा में नौ भागों के उत्तर दीजिए।

- |      |      |       |        |
|------|------|-------|--------|
| (i)  | (ii) | (iii) | (iv)   |
| (v)  | (vi) | (vi)  | (viii) |
| (ix) | (x)  | (xi)  | (xii)  |

**Unit – I** प्रथम इकाई

2. (a)  
(b)

Or/अथवा

- (a)  
(b)

**Unit – II** द्वितीय इकाई

3. (a)  
(b)

Or/अथवा

- (a)  
(b)

**Unit – III** तृतीय इकाई

4. (a)  
(b)

Or/अथवा

- (a)  
(b)

**Unit – IV** चतुर्थ इकाई

5. (a)  
(b)

Or/अथवा

- (a)  
(b)