Shree H. N. Shukla College of Science

(Affiliated to Saurashtra university)
Nr. Lalpari Lake, B/h Marketing Yard, Rajkot-360 003
Ph. No. : 9099063150, 97277 53360

Paper: Physics-401
(Thermodynamics & Electronics)

UNIT -1: (12 hour: 14 Mark)

Laws of thermodynamics: Thermodynamic System, Thermal equilibrium and Zeroth law of thermodynamics, Thermodynamic Equilibrium, Internal energy, Concept of Heat, First law, Specific heat of the gas – Mayer's formula, Various thermodynamics processes [only Definition], work done during isothermal and adiabatic processes, Cooling due to adiabatic reversible process, Joule Thomson expansion -the Porus Plug experiment, Heat engine and efficiency, Reversible and Irreversible processes, Carnot's ideal Engine and Carnot's cycle, Reversible and irreversible engine, second law of thermodynamics, Carnot theorem, Numerical Examples.

UNIT -2: (12 hour: 14 Mark)

Entropy: Concept of Entropy, Entropy change in - Adiabatic ,Reversible and Irreversible processes, Principle of increase of Entropy, The T- S Diagram, The calculation of Entropy , Third law of Thermodynamics, Unattainability of absolute Zero, Application of the Entropy principle, Entropy and Disorder, Numerical Examples.

Theory of Radiation: Thermal Radiation, Black Body and Black Body Radiation , Kirchhoff's Law, Stefan Boltzmann Law, Distribution of Energy in Black Body Spectrum, Wien's Displacement Law & Wien's law of energy distribution, Rayleigh- Jeans Law, Plank's Law, Wien's law and Rayleigh – Jeans law in relation to Planck's law, Numerical Examples.

UNIT -3: (12 hour: 14 Mark)

Thermodynamic potentials: Thermodynamic potentials and their relationships with thermodynamic variables- [Enthalpy, Gibbs, Helmholtz and internal energy functions, Maxwell's relations] , Applications of Maxwell's relations – Clausius- Clapeyron Equation, Specific Heat Equation, Joule-Thompson Effect & Joule- Thompson Coefficient , TdS Equations, Numerical Examples.

Basic reference book for unit 1 to 3:

1) Heat thermodynamics and statistical Physics By Singhal, Agrawal & Prakash, Publisher: Pragati Prakashan.
2) Heat thermodynamics and Statistical Physics By Brijlal, N. Subrahmanyam & P.S. Hemne, Publisher: S.Chand

UNIT -4: (12 hour: 14 Mark)

Semiconductor device: Principle, Working and Construction of - LED, Advantages of LED, Multicolor LED, Application of LED, Principle, Construction, Working and Applications of - Photo Diode, Varactor diode, Solar Cell, Thermistor.

FET- Types of FET, Construction and Working JFET, Advantage of JFET and difference between JFET and BJT, Output Characteristics of JFET, Parameters of JFET, J-FET Biasing, Construction & Working of UJT, Equivalent circuit of UJT, Characteristics of UJT, Advantages & Applications of UJT, Numerical Examples .

Digital Circuit: Analog and Digital Signal, Introduction to Number Systems, Decimal to Binary and Binary to Decimal Conversion, Binary Coded Decimal Code, Logic Gates- AND, OR and NOT Gates using Diode, NAND & Nor Gate , NAND and NOR Gate as a universal gate , X-OR Gates, Bollean Algebra and Theorems, De Morgan's Theorems, Simplification of Logic Circuit using Boolean Algebra, Numerical Examples.

Basic Reference Books:

1) Principles of electronics By V.K.Mehta & Rohit Mehta Publisher: S.Chand
2) Basic Electronics By B.L.Thereja Publisher : S.Chand

UNIT -5: (12 hour: 14 Mark)

A.C. Circuit: L-R circuit, R-C Circuit, L-C Circuit, L-C-R series and parallel Circuit with resonance, Numerical Examples.

A.C Bridge & their applications : A.C. Bridge –Condition for Bridge Balance (Impedence Bridge), Maxwell's Impedence & L/C Bridge, Owen's Bridge, De Sauty's Bridge, Wien's Bridge, Schering Bridge, Kohlraush's

Oscillators : Sinusoidal oscillators, Positive feedback, Barkhausen Criterion, Different types of transistor oscillators, Colpitt's Oscillator, Hartley Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator, Numerical Examples.

Basic Reference books :

1) Electricity and Magnetisam By D.C. Tayal Publisher : Himaliya publishing House.
2) Moderan Electronics instrumentation and Mesurement techniques By Albert D Helfrick & William D Cooper Publisher : PHI
3) Principles of electronics By V.K.Mehta & Rohit Mehta Publisher: S.Chand

Other Reference books for semester 4 :

1) University Physics By Ronald Lane Reese Publisher: Thomson Brooks
2) Concept of physics By H C Verma part 1 Publisher: Bharati Bhawan
3) University Physics with modern physics By Sears ,Zemansky & H D Young Publisher: PEARSON
4) Basic electronics and linear circuits By N N BhargavA, D C Kushreshtha, S C Gupta Publisher: Technical Teachers Training Institute Chandigarh.
5) Elements of Electronics By Bagde & Singh, Publisher: S.chand
6) Electronic Device And Circuits By Allen Mottershead, Publisher: PHI
7) Thermodynamics, kinetic theory & Statistical thermodynamics By F.W.Sears & G.L.Salinger, Publisher: Narosa
8) Thermal Physics By S.garg, R.Bansal & C. Ghosh, Publisher: TMG
9) Heat & Thermodynamics by Mark W. Zemansky and R.H. Dittman, Publisher:McGraw Hill, Int. 7th edition.

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LIST OF EXPERIMENTS for B.Sc. (Physics) semester -4

1. To Verify Stefan's Law.
2. To determine the thermal conductivity of cardboard by Lee's Method.
3. To determine the wavelength of using Diffraction grating.
4. To determine high resistances by method of leakage.
5. To compare the capacities of two capacitors by De Sauty's bridge.
6. To determine specific resistance of electrolyte by Kohlrauch's bridge.
7. To determine the self induction by Maxwell Bridge.
8. To determine the modulus of rigidity by Maxwell's needle.
9. To determine the modulus of rigidity by Statistical method (Barton's apparatus).
10. To study the resistance temperature characteristics of Thermistor & Determine energy band gap of semiconductor material by Thermistor.
11. To study of characteristics of Solar Cell.
12. To study the characteristics of FET & Determination of parameters of FET.
13. To study Characteristics of Uni Junction Transistor.
14. Verification of truth table of AND, OR, NOT, NAND & NOR gate.
15. To study NAND gate & NOR gate as Universal gate.
16. Construction of FET as Voltmeter.
17. Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).
18. To study L-R and R-C circuit
19. To study a series resonant L-C-R circuit & Determine resonate frequency and quality factor.
20. To study a parallel resonant L-C-R circuit & Determine resonate frequency and quality factor.