Krantiguru Shyamji Krishna Verma

Kachchh University

Mundra Road

BHUJ :370 001

SYLLABUS (NEP 2020)

B. Sc. Semester III & IV

PHYSICS

B. Sc. Semester III

CODE : MJPHY – 301, 302 - P, 303, 304 - P, 305, 306 - P,
MDPHY – 307, 308 - P

B. Sc. Semester IV

MJPHY – 401, 402 - P, 403, 404 - P, 405, 406 - P,
MNPHY – 407, 408 - P

Semester - III
KSKV Kachchh University
B.Sc. (Physics) NEP 2020 Syllabus
In force from June 2024

MJPHY – 301

Magnetism, Electronics
(For Major Only) (3 Credit)

Unit-I

Magnetism

The Lorentz Force Law: Magnetic Fields, Magnetic Force, Currents; The Biot-Savart Law: Steady Currents, The Magnetic Field of a Steady Current; The Divergence and Curl of B : Straight Line Currents, The Divergence and Curl of B, Applications of Ampere's Law, Comparison of Magnetostatics and Electrostatics; Magneic Vector Potential : The Vector Potential.

Ref.: Introduction to Electrodynamics by David J. Griffiths
(Chapter 5 Art. 5.1 to 5.3 & 5.4.1)

Unit-II

Transistors

Transistor connections; Common Base Connection; Characteristics of common Base connection; Common Emitter connection; Measurement of leakage current; Characteristics of Common Emitter connection; Common Collector connection; Comparison of Transistor connections; Commonly used Transistor connection; Transistor as an Amplifier in CE arrangement; Transistor Load line Analysis; Operating Point; Practical way of drawing CE Circuit; Output from Transistor Amplifier; Performance of Transistor Amplifier, Cut off and saturation Points

Ref. : Principles of Electronics by V.K Mehta and Rohit Mehta (Chapter 8, Art. 8.7 to 8.22)

Unit-III

Transistor Biasing:

Introduction; Faithful Amplification; Transistor biasing; inherent variations of Transistors parameters; Stabilization; Essentials of Transistor biasing circuit; Stability factor; Methods of Transistor biasing; Base resistor method; Emitter Bias circuit; Circuit Analysis of Emitter Bias; Biasing with collector Feedback resistor; Voltage divider bias method; Stability factor for potential divider bias;

Hybrid parameters; Determination of h-parameter; h-parameter equivalent circuit; The h-parameters of a Transistor; nomenclature for transistor's h-parameters;

Ref. : V.K Mehta and Rohit Mehta
Chapter- 9, 9.1 to 9.13 Chapter - 24 , 24.1 to 24.3, 24.5,24.6

MJPHY – 302 - P PRACTICALS
(For major Only) (1 Credit)

(1) Flatness of plate by Newton's rings
(2) Thickness of a glass plate and radius of curvature of convex lens by optical lever
(3) Logic Gates
(4) 'L' by Maxwell's Bridge
(5) Study of Transformer
(6) Caushy's Constants
(7) Simulation of Nuclear Radio Active Decay using Calculator

MJPHY – 303
Optics
(For major Only) (3 Credit)
Unit-I

Optics

Fresnel Diffraction: Introduction; Huygens-Fresnel Theory; Fresnel's Assumptions; Rectilinear Propagation of Light; Zone Plate; Action of a zone plate for an incident spherical wave front; Difference between a zone plate and a convex lens; Distinction between Interference and Diffraction; Fresnel and Fraunhoffer Types of diffraction; Diffraction at a Circular Aperture; Mathematical Treatment of Diffraction at a circular Aperture; Intensity at a Point away from the centre.

Fraunhoffer Diffraction: Introduction; Fraunloffer Diffraction at a Single Slit; Fraunhoffer Diffraction at Double Slit; Interference and Diffraction.

Ref. : A Textbook of OPTICS by Subrahmanyam, Brijlal, Avadhanulu
S. Chand & Company Ltd., New Delhi. Twenty fourth Revised Edition 2010
(Chapter 17, Art. 17.1 to 17.8; Chapter 18, Art. 18.1, 18.2, 18.4, 18.5)

Unit-II

Optics

Resolving Power: Resolving Power; Rayleigh's Criterion; Limit of Resolution of the Eye; Limit of resolution of a Convex lens; Resolving power of optical instruments; Criterion for Resolution according to lord Rayleigh; Resolving power of a Telescope; Resolving power of a microscope; Ways of increasing resolution; Magnification versus Resolution.

Fiber optics : Introduction; Optical fiber; Necessity of Cladding; Optical fiber System; Optical Fiber Cable; Total internal reflection; Propagation of light through and optical fiber; Critical Angle of Propagation; Acceptance Angle; Fractional refractive index; Numerical aperture; Fiber optic Communication system; Merits of Optical Fiber.

Ref.: A Textbook of OPTICS by Subrahmanyam, Brijlal, Avadhanulu
S. Chand & Company Ltd., New Delhi. Twenty fourth Revised Edition 2010
(Chapter 19, Art. 19.1 to 19.10; Chapter 24, Art. 24.1 to 24.6, 24.21, 24.22)

Unit-III

LASERS

Introduction; Attenuation of Optical medium; Thermal Equilibrium, Interaction of Light with matter; Absorption; Spontaneous Emission; Einstein Coefficient's and their relations; Einstein coefficients; Einstein Relations; Light Amplification; Condition for Stimulated Emission to dominate Spontaneous Emission; Condition for Stimulated Emission to dominate Absorption transitions; Meeting the three requirements; Population Inversion; Metastable States; Confining radiation with the medium; components if Laser; Active medium; Pump; Optical Resonant Cavity ; Lasing Action; Threshold for Oscillation; Principal pumping Scheme; Three level Pumping Scheme; Four level pumping Scheme; comparison of Four Level Laser with the Three level Laser; Necessity of broad absorptions band at pumping Level;
Types of LASERS; He-Ne Laser; CO2 Laser; LASER beam characteristics; Fabrications

Ref : A Text book of Optics By Dr. N Subramanium, Brijlal
(Chapter : 22.1 to 22.10, 22.14.3, 22.14.4,22.16,22.17)

MJPHY – 304 - P PRACTICALS
(For major Only) (1 Credit)

(1) Study of X-ray diffraction pattern
(2) 'g' By bar pendulum
(3) Resolving power of Telescope
(4) High R by Leakage
(5) Characteristics of FET
(6) Hartman Formula
(7) To Determine The Band Gap By Measuring The Resistance of a Thermistor at Different Temperatures

MJPHY – 305

Nuclear Physics, Atomic Spectra, Molecular Spectra
(For major Only) (3 Credit)

Unit-I

Nuclear Physics

Physical Tools: Interaction between particles and matter: A brief survey ; Detectors for Nuclear Particles: (i) Proportional Counter (ii) The Geiger Counter (iii) Scintillation Counter (iv) Solid state or Semi conductor Detector (vi) Cloud and Bubble Chambers; Particle Accelerators: (i) Van de Graaff Generator (ii) The cyclotron.

The Q Equation: Introduction; Types of Nuclear Reactions; The balance of Mass and Energy in Nuclear Reaction; The Q Equation; Solution of Q Equation.

Ref. : Nuclear Physics by S.B Patel
(Chapter 1, Art.1.I.2 to 1.I.4; Chapter 3, Art. 3.1 to 3.5)

Unit-II

Atomic Spectra

Orbital Magnetic Dipole moment: Bohar Magnetron; Larmor Precession; space quantization; Electron Spin; Vector model of the atom; Spectroscopic terms and their notations; The Stern-Gerlach experiment;

Normal and Anomalous Zeeman effect; Explanation of Normal Zeeman effect; Explanation of Anomalous Zeeman effect.

Ref. : Atomic and Molecular Spectra By Rajkumar (Kedar Nath Ramnath Publication)
(Chapter 4, Art. 1 to 7; Chapter 12, Art. 1 to 3)

Unit-III

Molecular Spectroscopy

Types of Molecular Energy States and Molecular Spectra: Types of molecular spectra.
Separation of electronic and nuclear motion: The Born-Oppenheimer Approximation.

Ref.: Atomic and Molecular Spectra by Raj Kumar (Chapter 17, Art. 1, 2)
Pure Rotational Spectra : Salient features of rotational spectra; Molecular requirement for rotational spectra; Experimental arrangement; Molecule as a rigid rotator – Explanation of rotational spectra (without solving Schrodinger equation to get energy formula); The non rigid rotator; Isotope effect.
Ref.: Atomic And Molecular Spectra by Raj Kumar
(Chapter 18, Art. 1 to 6)

Classification of Molecular Electronic States: Molecular electronic states; Symmetry properties of electronic eigen functions.

Ref.: Atomic And Molecular Spectra by Raj Kumar (Chapter 24, Art. 1 and 2)

MJPHY – 306 - P PRACTICALS
(For major Only) (1 Credit)

(1) Absorption co-efficient of Liquid by photocell
(2) Permeability of Free space
(3) Nand Gate as universal gate
(4) h- Parameters
(5) Characteristics of UJT
(6) Numerical Interpolation
(7) Obtain I – V Characteristics and Resistance of LDR at Different Light Level

MDPHY – 307
Magnetism, Electronics
(For Multidisciplinary Only) (3 Credit)

Unit-I

Magnetism

The Lorentz Force Law: Magnetic Fields, Magnetic Force, Currents; The Biot-Savart Law: Steady Currents, The Magnetic Field of a Steady Current; The Divergence and Curl of B : Straight Line Currents, The Divergence and Curl of B, Applications of Ampere's Law, Comparison of Magnetostatics and Electrostatics; Magneic Vector Potential : The Vector Potential.

Ref.: Introduction to Electrodynamics by David J. Griffiths
(Chapter 5 Art. 5.1 to 5.3 & 5.4.1)

Unit-II

Transistors

Transistor connections; Common Base Connection; Characteristics of common Base connection; Common Emitter connection; Measurement of leakage current; Characteristics of Common Emitter connection; Common Collector connection; Comparison of Transistor connections; Commonly used Transistor connection; Transistor as an Amplifier in CE arrangement; Transistor Load line Analysis; Operating Point; Practical way of drawing CE Circuit; Output from Transistor Amplifier; Performance of Transistor Amplifier, Cut off and saturation Points

Ref. : Principles of Electronics by V.K Mehta and Rohit Mehta (Chapter 8, Art. 8.7 to 8.22)

Unit-III

Transistor Biasing:

Introduction; Faithful Amplification; Transistor biasing; inherent variations of Transistors parameters; Stabilization; Essentials of Transistor biasing circuit; Stability factor; Methods of Transistor biasing; Base resistor method; Emitter Bias circuit; Circuit Analysis of Emitter Bias; Biasing with collector Feedback resistor; Voltage divider bias method; Stability factor for potential divider bias;

Hybrid parameters; Determination of h-parameter; h-parameter equivalent circuit; The h-parameters of a Transistor; nomenclature for transistor's h-parameters;

Ref. : V.K Mehta and Rohit Mehta

Chapter- 9, 9.1 to 9.13 Chapter - 24 , 24.1 to 24.3, 24.5,24.6

MDPHY – 308 - P PRACTICALS

(For Multidisciplinary Only) (1 Credit)

(1) Flatness of plate by Newton's rings
(2) Thickness of a glass plate and radius of curvature of convex lens by optical lever
(3) Logic Gates
(4) 'L' by Maxwell's Bridge
(5) Study of Transformer
(6) Caushy's Constants
(7) Simulation of Nuclear Radio Active Decay using Calculator

Semester – IV
KSKV Kachchh University
B.Sc. (Physics) NEP 2020 Syllabus
In force from June 2024

MJPHY – 401
Solid State Physics, Atmospheric Physics, Plasma
(For major Only) (3 Credit)

Unit-I

Solid State Physics

Crystallography: Introduction; Single and Polycrystalline crystals; Symmetry considerations; Periodicity in crystals; Unit cell; Number of atoms or lattice points per unit cell; Representation of planes: Miller indices; Spacing of planes in crystal lattice; Density of lattice points; Symmetry elements; Symmetry groups; Point groups; Space group; Characteristics of space group; Determination of space group; Classification of crystals; Bravais lattice in two dimensions; Bravais lattice in three dimensions; Different crystal structures; Hexagonal close-packed structure; Face-centered cubic or cubic close-packed structure; Body-centered cubic structure; Simple cubic structure; Diamond structure; Zinc blende structure; Sodium chloride structure; Cesium chloride structure.

Diffraction of X-rays: Determination of Crystal Structure; Bragg's law; Bragg's law in one dimension; Bragg's law in three dimension; Characteristics features of Bragg's law.

Ref.: Fundamentals of Solid state physics by Saxena Gupta Saxena
(Chapter 1, Art. 1.1 to 1.18; Chapter 2, Art. 2.1, 2.2)
Rudiments of Material Science by S.O. Pillai & Sivakami Pillai

Solid state physics by C.Kittle

Unit-II

Space & Atmospheric physics:

Introduction, the Sun and solar wind, the atmosphere and ionosphere, Geomagnetic field and magnetosphere, nomenclature, the Sun earth relation,

Atmospheric vertical structure: Hydrostatic equilibrium, The exosphere, Heat balance and vertical temperature profile, Composition, Winds and tides

Ref.: The solar terrestrial Environment, by J. K. Hargreaves

https://drive.google.com/file/d/1ZpFU5eJoRmVxc9nHIcV9r7hcPzKHgsxS/view?usp=drive_link

(Ch 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, Ch 4: 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1)

Unit –III

Plasma

Occurrence of Plasmas in Nature; Definition of Plasma; Concept of Temperature; Debye Shielding; The Plasma Parameter; Criteria for Plasmas; Applications of Plasma Physics.

Ref. : Introduction to Plasma Physics and Controlled Fusion by Francis F. Chen (Chapter 1 Art. 1.1 to 1.7)

MJPHY – 402 - P PRACTICALS

(For Major Only) (1 Credit)

(1) Wavelength of prominent Lines of Hg spectrum by Grating
(2) Planck's Constant by LEDs
(3) Measurements by C.R.O
(4) Figure of merit of Ballistic Galvanometer.
(5) e/m by Thomson's Method
(6) Resonance pendulum
(7) Numerical Integration by Trepezoidal Method

MJPHY – 403

Mathematical Physics, Classical Mechanics, Quantum Mechanics

(For major Only) (3 Credit)

Unit-I

Mathematical Physics

Coordinate System : Curvilinear coordinates; Orthogonal Curvilinear coordinates; Element of surface area; Volume element; Gradient in Orthogonal Curvilinear coordinates; Divergence in Orthogonal Curvilinear coordinates; Curl of a vector in Orthogonal Curvilinear coordinates; Rectangular Cartesian coordinates; Spherical polar coordinates; Cylindrical coordinates. (NO DERIVATIONS)

Ref.: Introduction to Classical Mechanics by R. G. Takwale & P.S. Puranik (Appendix A, Art. A.1 to A.9 & A.11)

Differential Equations : Some partial differential equations in Physics; The method of separation of variables; Separation of Helmholtz equation in Cartesian coordinates; Separation of Helmholtz equation in Spherical polar coordinates; Separation of Helmholtz equation in cylindrical coordinates;

Ref. : Mathematical Physics by P. K. Chattopadhyay

(Chapter 2, Art. 2.1 & 2.2)

Second Order Differential Equations: Ordinary and singular points; Series solution around an ordinary point; Series solution around a regular singular point: The method of Frobenius.

Ref.: Mathematical Physics by P.K. Chattopadhyay
(Chapter 3, Art. 3.1 to 3.3)
More Ref. – Mathematical Physics By H.K. Das, Mathematical Physics By Satya Prakash

Unit-II

Classical Mechanics

Mechanics of System of particles; Motion of a system with variable mass;
Moving Coordinate system: Coordinate system with relative translational motions; Rotating coordinate systems; The coriolis force; Motion on the earth; Effect of coriolis force on a freely falling particle.
Ref. : Introduction to Classical Mechanics by R.G. Takwale & P.S. Puranik
(Chapter 3, Art. 3.5 & 3.6; Chapter 9, Art. 9.1 to 9.5)
More Ref. - Classical Mechanics by J C Upadhyay

Unit-III

Quantum Mechanics

Difficulties with classical models; Optical Spectra; Blackbody radiation; The Franck-Hertz experiment.
Photons as particles: The Compton effect; Particle diffraction.
Ref.: Quantum Mechanics by John. L. Powell, Bernd Crasemann
(Chapter 1, Art. 1.1 to 1.3, 1.5; Chapter 2, Art. 2.1, 2.2)
Quantum Mechanics; The wave equation; Schrodinger's Equation: Time Dependent form; Expectation Values; Schrodinger's Equation: Steady state form; Particle in Box.
Ref.: Concepts of Modern Physics by Arthur Beiser.
(Chapter 5, Art. 5.1 to 5.6)

MJPHY – 404 - P PRACTICALS
(For major Only) (1 Credit)

(1) Y- By Koening's Method
(2) Study of Electron Diffraction pattern
(3) C_1/C_2 by Desauty's Method
(4) Transistor Amplifier
(5) Wavelength of light by Edser's diffraction pattern
(6) Air Wedge Interference
(7) Numerical solution of secular Determinant

MJPHY – 405
Electronics, Relativity
(For major Only) (3 Credit)

Unit-I

Resonance : Definition of Q, the factor of merit; Series Resonance; Band width of the series resonant circuit; Parallel resonance or anti resonance; Currents in anti resonant circuits; Band width of anti resonant circuits.
Ref. : Networks, Lines and Fields by John D. Ryder
(Chapter 2, Art. 2.1 to 2.4, 2.6, 2.8)

Amplitude Modulation : Introduction; Amplitude modulation; Amplitude modulation index; Modulation index for Sinusoidal AM; Frequency spectrum for Sinusoidal AM; Average power for Sinusoidal AM; Effective voltage and current for Sinusoidal AM.
Ref. : Electronic Communications by Dennis Roddy, John Coolen
(Chapter 8, Art. 8.1 to 8.7)

Unit-II

Digital Electronics

Number Systems and Codes : Hexadecimal numbers; Hexadecimal - Binary conversions; Hexadecimal - to - decimal conversion.
Ref. : Digital Computer Electronics by Albert Paul Malvino (Second Edition)
(Chapter 1, Art. 1.8 to 1.10)

More Logic Gates : NOR gates; De Morgan's First theorem; NAND gates; De Morgan's Second theorem; Exclusive OR gates.
Ref. : Digital Computer Electronics by Albert Paul Malvino (Second Edition)
(Chapter 3, Art. 3.1 to 3.5)

Boolean Algebra and Karnaugh Maps : Boolean relations; Sum - of - Products method; Algebraic simplification; Karnaugh maps; Pairs, Quads and Octets; Karnaugh simplifications; Don't Care Conditions.
Ref. : Digital Computer Electronics by Albert Paul Malvino (Second Edition)
(Chapter 5, Art. 5.1 to 5.7)

Arithmetic – Logic Units : Binary addition; Binary subtraction; Half adders; Full adders; Binary adders.
Ref. : Digital Computer Electronics by Albert Paul Malvino (Second Edition)
(Chapter 6, Art. 6.1 to 6.5)

Memories : Roms; Proms and Eproms; Rams; A small TTL Memory; Hexadecimal Addresses.
Ref. : Digital Computer Electronics by Albert Paul Malvino (Second Edition)
(Chapter 9, Art. 9.1 to 9.5)

Unit-III

Relativity

Introduction, Frame of reference, Newtonian Relativity, Gallalion Transformation equations, The Ether Hypothesis, The Michelson Morley Experiment, Special Theory of Relativity, The Lorentz Transformation equations, Length Contraction, Time Dilation,

Ref.: Modern Physics by R. Murugeshan, Er. Kiruthiga Sivaprasath – S Chand Pub. (Chapter 1.1 to 1.10)

Doppler Effect, Twin Paradox, Relativistic Momentum, Mass and energy, Energy and Momentum, Mass less particles.

Ref.: Concepts of Modern Physics by Arthur Beiser, Sixth edition.

(Chapter 1, Art. 1.3, 1.5, 1.7 to 1.9)

MJPHY – 406 - P PRACTICALS
(For major Only) (1 Credit)

(1) I – V Characteristics of Solar Cell – to find Fill Factor and Fill Voltage
(2) Double refraction in calcite prism.
(3) Series Voltage Regulator
(4) Wavelength of a LASER Light
(5) Searl's Goniometer
(6) Load line and Determination of Q – point for BJT
(7) Grey to Binary code Conversion

MNPHY – 407
Solid State Physics, Atmospheric Physics, Plasma
(For Minor Only) (3 Credit)

Solid State Physics, Atmospheric Physics, Plasma
(For major Only) (3 Credit)

Unit-I

Solid State Physics

Crystallography: Introduction; Single and Polycrystalline crystals; Symmetry considerations; Periodicity in crystals; Unit cell; Number of atoms or lattice points per unit cell; Representation of planes: Miller indices; Spacing of planes in crystal lattice; Density of lattice points; Symmetry elements; Symmetry groups; Point groups; Space group; Characteristics of space group; Determination of space group; Classification of crystals; Bravais lattice in two dimensions; Bravais lattice in three dimensions; Different crystal structures; Hexagonal close-packed structure; Face-centered cubic or cubic close-packed structure; Body-centered cubic structure; Simple cubic structure; Diamond structure; Zinc blende structure; Sodium chloride structure; Cesium chloride structure.

Diffraction of X-rays: Determination of Crystal Structure; Bragg's law; Bragg's law in one dimension; Bragg's law in three dimension; Characteristics features of Bragg's law.

Ref.: Fundamentals of Solid state physics by Saxena Gupta Saxena
(Chapter 1, Art. 1.1 to 1.18; Chapter 2, Art. 2.1, 2.2)
Rudiments of Material Science by S.O. Pillai & Sivakami Pillai

Solid state physics by C.Kittle

Unit-II

Space & Atmospheric physics:

Introduction, the Sun and solar wind, the atmosphere and ionosphere, Geomagnetic field and magnetosphere, nomenclature, the Sun earth relation,

Atmospheric vertical structure: Hydrostatic equilibrium, The exosphere, Heat balance and vertical temperature profile, Composition, Winds and tides

Ref.: The solar terrestrial Environment, by J. K. Hargreaves

https://drive.google.com/file/d/1ZpFU5eJoRmVxc9nHIcV9r7hcPzKHgsxS/view?usp=drive_link

(Ch 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, Ch 4: 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2.1)

Unit –III

Plasma

Occurrence of Plasmas in Nature; Definition of Plasma; Concept of Temperature; Debye Shielding; The Plasma Parameter; Criteria for Plasmas; Applications of Plasma Physics.

Ref. : Introduction to Plasma Physics and Controlled Fusion by Francis F. Chen (Chapter 1 Art. 1.1 to 1.7)

MNPHY – 408 - P PRACTICALS
(For Minor Only) (1 Credit)

(1) Wavelength of prominent Lines of Hg spectrum by Grating
(2) Planck's Constant by LEDs
(3) Measurements by C.R.O
(4) Figure of merit of Ballistic Galvanometer.
(5) e/m by Thomson's Method
(6) Resonance pendulum
(7) Numerical Integration by Trepezoidal Method

KSKV Kachchh University: BHUJ

SECOND YEAR B.Sc

SUBJECT: PHYSICS

PATTERN OF QUESTION PAPER

Total Marks: 40, Duration: 2 hours 15 min

Passing standard: 16 Marks

FOR SEMESTER-END EXAMS

Questions	Type of Quetion	Marks
Question – 1 (Unit I)	Two Questions of 10 Marks. Students have to attempt any one	10
Question – 2 (Unit II)	Two Questions of 10 Marks. Students have to attempt any one	10
Question – 3 (Unit III)	Two Questions of 10 Marks. Students have to attempt any one	10
Question – 4	12 short questions of 1 marks,4 questions from each unit and the students have to attempt any 10.	10

- The structure for FIRST Three question is as under:

Descriptive type *(with internal option)* **10 Marks**

(1) Examiner can ask two questions of 10 Marks each, out of which one must be answered, The types of questions are varied, like: Derivations, Short/Long notes, Explain, Deduce, Problems etc.10 marks can be divided into 7+3 or 6+4 or 5+5 marks according to the type of question.

- The structure for Fourth question is as under: 10 Marks

Twelve questions from all three units out of which ten questions shall be answered. Each of 01 marks makes total 10 Marks.

The types of questions are varied, like: Definitions, Reasoning, Explain, Drawing figures, Multiple choice answers, etc.

PRACTICAL

There will be FOUR Exercises in each Practical, as under, total of 20 **Marks.**

(1) Approach (6 marks) (2) Readings and Calculations (6 marks) (3) Viva (6 marks) (4) Practical Journal(2 marks)

Duration of the exam: 3 Hrs.

Examiner will submit marks out of 10 to University

Passing standard: **4 Marks out of 10 Marks.**