DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE

(Linguistic Minority Institution)

[AUTONOMOUS]

Accredited at 'A' Grade by NAAC

B.Sc. PHYSICS SYLLABUS

(Effective from 2011-2012)

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ANNEXURE – II

Question Paper Pattern for B.Sc Physics Degree Course based on CBCS Pattern

(except non-major elective)

THEORY

Maximum Ext. Marks: 75

Duration: 3 hours

PART A (50 words)

To answer 10 questions

out of 12 questions 10x2marks=20 marks

PART B (200 words)

To answer 5 questions

out of 7 question 5X5 marks=25 marks

PART C (500 words)

To answer 3 questions

out of 5 question 3X10marks=30 marks

Total 75 marks

ANNEXURE – III

Pattern of Internal Evaluation for B.Sc Physics Degree Course

based on CBCS Pattern

THEORY

Maximum Int. Marks: 25

Best Two tests out of 3	15 marks
Attendance	5 marks
Assignment/Seminar	5 marks

PRACTICAL

Maximum Int. Marks: 40

Attendance	5 marks
Practical Tests best 2 out of 3	30 marks
Record	5 marks

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DEPARTMENT OF PHYSICS
B.Sc DEGREE COURSE IN PHYSICS

Syllabus

Semester – V

Core Paper- 5

ELECTRICITY AND ELECTROMAGNETISM

(Effective from 2011-2012)

No. of crédits: 5

No. of hours allotted: 5/ Week

Unit 1: Chemical Effects of Electric Current

Faraday's laws of electrolysis - ionic velocities and mobilities - Calculation - experimental determination of ionic mobilities - transport number. Thermoelectricity- Peltier effect - Experimental determination of Peltier coefficient - Thomson coefficient - experimental determination of Thomson coefficient - application of thermodynamics to a thermocouple and connected relations - thermoelectric diagram and uses.

Unit 2: DC and AC Circuits

DC Circuits

Growth and decay of current in a circuit containing resistance and inductance - growth and decay of charge in a circuit containing resistance and capacitor - growth and decay of charge in an LCR circuit - condition for the discharge to be oscillatory - frequency of oscillation - network analysis - Thevenin and Norton's Theorems.

AC Circuits

AC voltage and current - Power factor and current values in AC circuit containing LCR - series and parallel resonant circuits - AC motors - single phase, three phase - star and delta connections - electric fuses - circuit brakers.

Unit 3: Magnetic effect of electric current

Biot and Savart's law - magnetic field intensity due to a solenoid carrying current - effect of iron core in a solenoid – magnetic field at a point due to circular current carrying coil - Helmholtz galvanometer - moving coil ballistic galvanometer - theory - damping correction – experimental determination of the absolute capacity of a condenser using B.G – experiment to compare the capacitance, emf of cells using B.G.

Unit 4: Electromagnetic induction and its applications

Faraday's laws of electromagnetic induction - inductance - determination of self inductance of a coil using Anderson method - mutual inductance - experimental determination of absolute mutual inductance - coefficient of coupling - earth inductor - Uses of earth inductor - measurement of horizontal component of the earth's magnetic field - measurement of vertical component of earth's magnetic field – angle of dip - calibration of B.G. - Induction coil and its uses.

Unit 5: Maxwell's equations and electromagnetic theory

Basic equations - types of currents - vacuum displacement current - Maxwell's equations - Maxwell's equations in free space - electromagnetic waves in free space - propagation of electromagnetic wave in a non conducting medium - Hertz Experiment - energy density of e.m. wave - Poynting's theorem - energy per unit volume.

Books for Study:

1. Electricity & Magnetism by M.Narayanamurthy & N.Nagarathnam, NPC pub., Revised edition.
2. Electricity and Magnetism by Brijlal and Subrahmanyam; S.Chand & Co., New Delhi, (2000).
3. Electricity & Magnetism by D.Chattopadhyay and P.C. Rakshit, Books and Allied (P) Ltd.(2001).
4. Fundamentals of Electricity and Magnetism by B.D. Dugal and C.L. Chhabra, Shobanlal Nagin, S. Chand & Co., 5th edition, New Delhi(2005).
5. Electricity and Magnetism by R. Murugeshan, S.Chand & Co., New Delhi, (2008).

Books for Reference:

1. Electricity & Magnetism by K.K.Tewari, S.Chand & Co., New Delhi, .(2002).

2. Introduction to Electrodynamics by D.J.Griffiths, Printice Hall of India Pvt. Ltd., 3rd Edition, New Delhi(2003).

Core Paper– 6

MATHEMATICAL METHODS IN PHYSICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 5/ week

Unit 1: Vector Analysis

Scalar and vector fields: Gradient, divergence and curl - physical interpretation, Lamellar and solenoidal field – (only definition), line, surface and volume integrals – Gauss Divergence theorem – Stoke's theorem – Green's theorem - Application of vectors to hydrodynamics: Equation of continuity, Bernoulli's theorem,

Unit 2: Matrices

Characteristic equation of a matrix – eigen values and eigen vectors – Cayley Hamilton theorem – Theorems on eigens values and eigen vectors – Hermitian and unitary matrices – Diagonalisation of matrices – matrices in Physics: rotation matrix, Pauli spin matrices (elementary ideas only).

Unit 3: Special functions

Gamma and Beta functions – definition – Evaluation – other forms of the functions – symmetry property of Beta function- relation between Beta and Gamma functions - Series solutions of Bessel's differential equation and Legendre differential equation.

Unit 4: Lagrangian formulation

Mechanics of a system of particles – Degrees of freedom – constraints – Generalised coordinates – Configuration space – principle of virtual work – D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle for a conservative system - Applications of Lagrange's equation: Atwood's machine, a bead sliding on uniformly rotating wire – simple pendulum.

Unit 5: Hamiltonian formulation

Phase space – Hamiltonian function H – physical significance – Hamilton's equations - Applications of Hamiltonian equations: Simple pendulum – motion of a particle in a central force field.

Books for study

1. Mathematical Physics by Satya Prakash, S.Chand & Sons, New Delhi (1996)
2. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House, Mumbai (2003).
3. Mechanics and Mathematical methods by R.Murugesan, S.chand & Company, New Delhi (1996)

Books for Reference

1. Mathematical Physics by B.D. Gupta, Vikas Publishing House Pvt. Ltd, New Delhi (1996)
2. Classical Mechanics by H. Goldstein, Special Indian Student Edition, Narosa Publishing House, New Delhi (1985)

Core Paper- 7

SOLID STATE PHYSICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 4/ Week

Unit I: Crystal structure

Crystal Lattice – Primitive cell - Unit cell - Seven classes of crystals - Bravais Lattice – crystal planes and Miller Indices – inter planar spacing in crystal lattice - structure of crystals - Simple cubic, Face centered Cubic, Body Centered Cubic crystal structure, Hexagonal close packed structure, Sodium Chloride, Diamond, Zinc Blende and Caesium Chloride structure.

Unit II: X- rays in crystal study

Diffraction of X-rays by crystals - Bragg's Law in one dimension - Experimental method in X-ray Diffraction - Laue method, rotating crystal method - Powder photograph method - Von Laue's equations – crystal imperfections - point defects, line defects - surface defects - volume defects - effects of crystal imperfections.

Unit III: Bonding and Super Conductivity

Types of bonds in crystals – Ionic, covalent, metallic, van-der-waal's and hydrogen bonding – characteristic of various bonding – cohesive energy of cubic ionic crystals – Madelung constant for sodium chloride crystal – Phonons – monoatomic one dimensional lattice – specific heat of solids – Einstein's theory – Debye theory.

Super conductivity – general properties of super conductors - Meissner effect – Type I and Type II super conductors – applications of super conductors.

Unit IV: Dielectrics

Fundamental definitions in dielectrics - different types of Electric polarization - frequency and temperature effects on polarization - dielectric loss - local Field on Internal Field Clausius-Mosotti Relation - Determination of dielectric constant - dielectric Breakdown - properties of different types of insulating materials.

Unit V: Magnetic materials

Different type of magnetic materials - Langevin's theory of diamagnetism - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - qualitative explanation of Heisenberg's internal field quantum theory of ferromagnetism.

Books for study

1. Introduction to solid state physics by Kittel, Wiely and sons, 7th edition.
2. Material science by Arumugam.M, Anuradha publishers.
3. Solid state physics, P.K. Palaniappan, Scitech publishers

Books for reference

1. Solid state physics, theory, applications and problems by S.L.Kakani, L.Hemrajani S.Chand and sons, New delhi.
2. Solid state physics A.J. Dekker, Mac.Millan India Ltd.
3. Concepts of modern physics by Arthur Bieser, Tata Mc.Graw Hill, 5th edition, 1997.
4. Modern physics, R.murugeshan.
5. Solid state physics, S.O. pillai.
6. Material science and engg, V.Ragharan, PHI.

Core paper - 8

BASIC ELECTRONICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 4/ Week

Unit 1: Semiconductors:-

Energy bands in a solid – intrinsic semiconductors – extrinsic semiconductors – Fermi level - pn junction – volt – ampere characteristic curve – biasing the pn junction - diode as rectifier – half wave rectifier – full wave rectifier – centre tapped, bridge rectifier – efficiency and ripple factor - circuits using diode – clipper, clamper – zener diode – zener diode as voltage regulator.

Unit II: Transistors:-

Basic transistor amplifier – Transistor input and collector characteristic – common base and common emitter amplifier – relation between α and ß – transistor biasing techniques – emitter bias – voltage divider bias. Transistor hybrid model – the h parameter – analysis of transistor amplifier (CE only) circuit using h parameters.

Unit III: Transistor amplifiers:-

Emitter follower, RC coupled amplifier – analysis using h parameters – frequency response – power amplifiers – classification – class A, push – pull, class B, power amplifier – collector efficiency – differential amplifier – A_d, A_{CM} and CMRR.

Unit IV: Oscillator and switching circuits:

Feedback in amplifier – negative feedback - Essential of transistor oscillator – basic LC oscillator circuit – Hartley oscillator – phase shift oscillator – Wein's bridge oscillator – expression for frequency. Types of multivibrators – Astable – monostable and bi-stable multivibrators.

Unit V: Special semiconductor devices:

Junction field transistor (JFET) – characteristics – Common source FET amplifier – UJT – characteristics – UJT as relaxation oscillator – SCR – characteristic – SCR as a rectifier.

Books for study

1. Electronic devices and circuits – Allen Mottershead Prentice – Hall of India.
2. Integrated electronics – Jacob Millman Christos c. Hallkias. Tata McGrawHills Edn.
3. Elements of electronics – M.K. Bagde, S.R. singh, Kamal Singh, S.Chand and company 2002.
4. Grob's basic electronics – Mitchel E Schultz – Tata McGraw_ Hill. Edn.
5. Functional electronics – K.V. Ramanan Tata McGraw Hill Edn.
6. Principles of electronics - V.K. Metha S.Chand and co 6th edition.

Semester – V

Elective - 1

APPLIED ELECTRONICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 4/ Week

Unit I: Operational Amplifier fundamentals

Characteristic – op-amp parameters – inverting amplifier- non- inverting amplifier – inity follower – summing amplifier – difference amplifie. Differentiator,integrator, comparator using op-amp.

Unit II: Analog computation and waveform generation

Analog computation and waveform generation using op amp – solving simultaneous equation – second order differential equation – square wave generation (astable operation) – sine wave generation – Wien's Bridge oscillator.

Unit III: 555 Timer

555 Timer – internal block diagram – and working – applications – Schmitt Trigger – astable, monostable multivibrator.

Unit IV: D/A and A/D converters

Introduction – Binary weighted resistor D/A converter – R -2R ladder method – resolution A/D converter – counter type – successive approximation type – resolution.

Unit V: Semiconductor Memories

Introduction – Volatile, non- volatile memories – ROM, PROM, EPROM, EEPROM, RAM (SRAM, DRAM), cache memory.

Books for study

1. Op- AMPs and Linear Integrated Circuits by Ramakant A.Gayakwad, Prentice Hall of India (1994)
2. Introduction to Integrated Electronics by V.Vijayendran, S.Viswanathan(printers and publishers) Pvt. Ltd, Chennai (2005)
3. Physics of Semiconductor Devices by Dilip K Roy, university press.

Books for reference

1. Linear integrated circuits by D. Roy Choudhury and Shail Jian – New Age International (P) Ltd (2003).
2. Integrated Electronics by J. Millman and C. Halkias, Tata McGraw Hill, New Delhi (2001).

Semester VI

Core Paper - 9

RELATIVITY AND QUANTUM MECHANICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 6/ week

Unit I: Relativity

Frame of reference – Gallilean transformation – Michelson – Morley experiment – Postulates of special theory of relativity – Lorentz transformation – length contraction – time dilation – relativity of simultaneity – addition of velocities – variation of mass with velocity – mass energy equation – Minkowski's four dimensional space – space time continuum – four vectors – elementary ideas of general theory of relativity.

Unit II: Wave nature of matter

Matter wave – phase and group velocity – wave packet – expression for de Broglie wavelength – experimental confirmation of particle waves – Davisson and Germer's experiment – G.P. Thomson's experiment – applications of electron diffraction – electron microscope – principle of complementarity – Heisenberg's uncertainity principle – experimental illustration of uncertainity principle – applications of uncertainity principle.

Unit III: Schrodinger's Equation

Inadequacy of classical mechanics – basic postulates of wave mechanics – properties of wave function – probability interpretation of a wave function – operator formalism – linear operators – self – adjoint operators – expectation value – eigenvalues and eigenfunctions – commutativity and compatibility – Schrodinger's equation - steady state and time dependent form.

Unit IV: Angular Momentum

Orbital angular momentum operators and their commutation relations – elementary ideas of spin angular momentum of an electron – Pauli matrices – spin matrices - properties.

Unit V: Solution of Schrodinger's Equations

Free particle solution – particle in a box – Qualitative treatment of the Barrier penetration problem (one dimension only), linear harmonic oscillator, rigid rotator and Hydrogen atom.

Books for study

1. A text book of Quantum mechanics by P.M.Mathews and S.Venkatesan, Tata McGraw – Hill, New Delhi (2005).
2. Quantum Mechanics by V.K. Thankappan, New Age International (P) Ltd. Publishers, New Delhi (2003).
3. Quantum mechanics by K.K. Chopra and G.C. Agarwal, Krishna Prakasam Media (P) Ltd, Meerut First Edition(1998)
4. Modern Physics by R. Murugeshan and Kiruthiga Sivaprasath, S. Chand & Co.,(2008)

Books for reference

1. Mechanics and Relativity by Brijlal Subramanyam, S.Chand & Co., New Delhi,. (1990)
2. Concepts of modern physics by Arthur Beiser. Tata McGraw - Hill, 5th edition, New Delhi (1997).
3. Introduction to quantum mechanics by Pauling and Wilson, McGraw – Hill.
4. Quantum mechanics byA.Ghatak and Loganathan, McMillan India Pvt. Ltd.

Core Paper-10

NUCLEAR AND PARTICLE PHYSICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 6/week

Unit I: General Properties of Nuclei

Nuclear size, charge, mass-determination of nuclear radius-mirror nucleus - mass defect and binding energy-packing fraction – nuclear spin – magnetic dipole moment – electric quadrupole moment – nuclear models – liquid drop model – Weizacker semi empirical mass formula – shell model and magic numbers – nuclear forces-meson theory of nuclear force(qualitative)

Unit II: Radioactivity

Natural radioactivity – properties of alpha, beta and gamma rays - alpha rays – characteristics - determination of e/m of alpha particle – determination of alpha particle - range – Geiger Nuttal experiment and law – α-ray spectra – Gamow's theory of α-decay (qualitative study) – beta rays – characteristics - beta ray spectra – neutrino hypothesis – violation of parity conservation – gamma rays – determination of wavelength - internal conversion – nuclear isomerism - law of disintegration – half life and mean life period – units of radioactivity – transient and secular equilibrium – radiocarbon dating – age of earth.

Unit III: Radiation Detectors and Particle Accelerators

Ionization chamber – G.M. Counter and resolving time – scintillation counter – photo multiplier tube – Linear accelerators – cyclotron – synchrocyclotron - betatron.

Unit IV: Nuclear Reactions

Conservation laws – nuclear reaction Kinematics-Q-value-threshold energy – artificial radioactivity – radioisotopes and its uses – classification of neutrons – nuclear fission – chain reaction – critical mass and size – nuclear reactor-breeder reactor – transuranic elements – nuclear fusion – thermonuclear reactions – sources of stellar energy.

Unit V: Elementary Particles

Classification of elementary particles – particles and anti particles – anti matter - fundamental interaction – elementary particle quantum numbers – isospin and strangeness – conservation laws.

Books for study

1. Atomic and nuclear Physics by N. Subrahmanyam and Brijlal, S. Chand & Co., New Delhi (1996).
2. Nuclear Physics by Tayal D.C., Himalaya publishing House, Mumbai(2006)

3. Nuclear Physics by R.C. Sharma, K. Nath & Co., Meerut (2000)
4. Nuclear Physics by Irving Kaplan, Narosa Publishing house, New Delhi.

Books for reference

1. Nuclear Physics by R.R. Roy and B.P. Nigam, New Age International (P) Ltd., New Delhi(1997)
2. Fundamentals of Elementary particle Physics by Longo, McGraw-Hill.
3. Nuclei and Particles by Serge., W.A. Benjamin, USA
4. Elements of Nuclear Physics by ML Pandya and RPS Yadav, Kedarnath Ram Nath, Meerut.

Semester VI

Elective -2

DIGITAL ELECTRONICS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 4/ Week

Unit I: Number System and Binary Code

Introduction, binary, octal and hexadecimal number system. Binary operations-addition; Subtraction, multiplication and division. Subtraction using 1's and 2's complement; BCD system.

Unit II: Combinational Logic Design

Standard representation of logical functions -SOP, POS- Karnaugh map representation and simplification (limited to four variables). Arithmetic circuits - half and full adders, half and full subtractors), BCD adder. Demultiplexers /Decoders, Multiplexers, Encoders, Code converters (BCD-to Binary, Binary to BCD converters).

Unit III: Flip flops

Sequential logic circuits – 1-bit memory, Latch, R-S Flip flop, J-K Flip flop – Race-around comdition – master – Slave Flip flop – T and D flip flops.

Unit IV: Registerrs and counters

Registers, Modes of operation, shift right, shift left registers. Counters (4 bit). Ripple (or) asynchronous Counters – synchronous counters –Up - down counters – decade counter – BCD counter.

Unit V: Introduction to IC technology

Basic fabrication steps: epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallisation. Process integration for integrated Circuits, Diodes and transistor for monolithic circuits, integrated resistors, capacitors.

Books for Study

1. Digital Principles and Application by Malvino Leach, Tata McGraw Hill, 4th Edition(1992).

2. Digital Fundamentals by Thomas L. Floyd, Universal Book Stall, New Delhi(1998).

3. Introduction to Integrated Electronics by V.Vijayendran, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai(2005).

4. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001)

Books for Reference

1. Digital Electronics by Practice Using Integrated Circuits - R.P.Jain - Tata McGraw Hill(1996).

2. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age International (P) Ltd.(2003).

3. Electronics - Analog and Digital by I.J. Nagrath - Prentice - Hall of India, New Delhi(1999).

Semester VI

ELECTIVE - 3

MICROPROCESSOR FUNDAMENTALS

(Effective from 2011-2012)

No. of credits: 5

No. of hours allotted: 4/ Week

Unit 1: Architecture

Architecture of 8085 – registers, flags, ALU, address and data bus, demultiplexing address/data bus – control and status signals – control bus, Programmer's model of 8085 – Pin out diagram – Functions of different pins.

Unit 2: Programming Techniques

Instruction set of 8085 – data transfer, arithmetic, logic, branching and machine control group of instructions – addressing modes – register indirect, direct, immediate and implied addressing modes.

Assembly language & machine language – programming techniques: addition, subtraction, multiplication, division, ascending, descending order, largest and smallest (single byte)

UNIT 3: Interfacing memory to 8085

Memory interfacing – Interfacing 2kx8 ROM and RAM, Timing diagram of 8085 (MOV R_d, R_s – MVI R_d, data(8) .

Unit 4: Interfacing I/O Ports to 8085

Interfacing input port and output port to 8085 – Programmable peripheral interface 8255 – flashing LEDs.

Unit 5: Interrupts

Interrupts in 8085 - hardware and software interrupts – RIM, SIM instructions – priorities – simple polled and interrupt controlled data transfer.

Books for Study

1. Microprocessor Architecture programming and application with 8085 / 8080A. by R.S.Gaonkar, Wiley Eastern Ltd.(1992).
2. Fundamental of microprocessor 8085 by V. Vijayendran, S.Viswanathan Publishers, Chennai(2003).
3. Fundamentals of Microprocessors and microcomputers by B.Ram - Dhanpat Rai publication.

Books for Reference

1. Introduction to microprocessor by Aditya Mathur - Tata Mc.Graw Hill Publishing Company Ltd.(1987).

2. Microprocessor and digital system by Dougles V. Hall - 2nd Edition - McGraw Hill Company (1983).

CORE PRACTICAL – III

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

General (Any 15 experiments)

1. Young's modulus – Koenig's method – Non uniform bending.
2. Young's modulus – Non uniform bending – optic lever – scale and telescope.
3. Newton's Rings - $R_1 R_2$ and μ of a long focus convex lens.
4. Spectrometer i – i' curve fixing i.
5. Spectrometer – Cauchy's constants.
6. Field along the axis of a circular coil – Deflection Magnetometer – B_H and M.
7. Field along the axis of a Circular coil – vibration magnetic needle.
8. EMF of Thermocouple – Potentiometer (199P method).
9. EMF of Thermocouple – Potentiometer (108P method).
10. Calibration of high range Voltmeter – Potentiometer.
11. Figure of merit – B.G.
12. Internal resistance of a cell – B.G.
13. Comparison of Capacitances – B.G.
14. Comparison of EMFs – B.G
15. Absolute capacitance of a capacitor -B.G.
16. Series resonance Circuit – LCR – finding L, Resonant frequency, Bandwidth, Q.
17. Spectrometer – narrow angled Prism.

CORE PRACTICAL – IV

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

Basic Electronics (Any 15 experiments)

1. Full wave Rectifier.
2. Bridge rectifier.
3. Zener regulated power supply – 9V - regulation characteristics.
4. Transistor characteristics – CB mode.
5. Transistor characteristics – CE mode.
6. Single Stage RC coupled amplifier – gain – frequency response.
7. Emitter follower.
8. Hartley oscillator.
9. Colpitt's oscillator.

10. Transistor – astable multivibrator.
11. Basic logic gates – AND, OR, NOT gates using diodes & transistors.
12. NAND/NOR universal building blocks.
13. De Morgan's theorem – Verification.
14. Half adder – full adder using IC - XOR, AND and OR gates.
15. Half subtractor, full subtractor using IC - XOR, AND and OR gates.
16. 4 bit ripple counter using IC 7473.
17. Decade counter - IC 7490.

PRACTICAL – V

(Practical Examination at the end of the Sixth semester)

No. of credits: 4

External: 60 marks. Record: 10 marks Practical Exam: 50 marks

Applied Electronics (Any 15 experiments)

1. OP Amp – IC 741 – Inverting amplifier, non –inverting amplifier, unity follower.
2. OP Amp – Summing and difference amplifier.
3. Op Amp – Differential amplifier – CMRR.
4. OP Amp – AC frequency response.
5. OP Amp – Square wave generator.
6. OP Amp – Wien's bridge oscillator.
7. OP Amp – Phase Shift oscillator.
8. 555 Timer – astable multivibrator.
9. 555 Timer – Schmitt Trigger.
10. D/A convertor – 4 bit binary weighted resistor method.
11. µp- 8085 8 bit addition, multiplication.
12. µp- 8085 8 bit subtraction, division.
13. µp - Sorting in ascending order – 8 bit data.
14. µp -Sorting in descending order – 8 bit data.
15. µp - Finding the largest number in an array.
16. µp - Finding the smallest number in an array.

The following procedure is to be followed for internal marks (40 marks)

Attendance: 5 marks

Practical test – best 2 out of 3: 30 marks

Record: 5 marks