Annexure No.	22 D
SCAA Dated	29.02.2008

BHARATHIAR UNIVERSITY
B. Sc. PHYSICS (SCHOOL OF DISTANCE EDUCATION)
For the students admitted during the academic year 2007-2008 Batch and Onwards

Subject Title		University Exam	
		Duration in Hours	**Maximum Marks**
I YEAR			
Language :	Tamil Paper I	3	100
Language :	English Paper I	3	100
Gr. A Core			
Paper I	General Physics I Heat, Thermodynamics, Mechanics, Properties of Matter and Sound	3	100
Paper II	General Physics II Optics, Electricity and Magnetism	3	100
Gr. B Allied A	Mathematical Paper	3	100
II YEAR			
Language :	Tamil Paper II	3	100
Language :	English Paper II	3	100
Paper III	Mathematical Physics	3	100
Gr B Allied A	Chemistry Paper	3	100
	Core Practical - I		50
	Core Practical - II		50
III YEAR			
Paper IV	Atomic Physics and Nuclear Physics	3	100
Paper V	Quantum Mechanics and Relativity	3	100
Paper VI	Solid State Physics	3	100
Paper VII	Applied Electronics	3	100
	Core Practical III	3	50
	Core Practical IV	3	50
	Total		1500

CORE PAPER I (B. Sc PHYSICS-SDE)
GENERAL PHYSICS I
HEAT, THERMO DYNAMICS, MECHANICS,
PROPERTIES OF MATTER AND SOUND

Subject Description:

This paper presents the principle of heat, thermo dynamics, mechanics properties of matter and sound. It is the knowledge of depth for the students regarding the energy of heat and sound.

Goal:

To enable the students in order learn the basic principles theory and concepts.

Objectives

To give the description for the students in order to

- understand the basic principle of thermodynamics
- have a clear understanding of laws of mechanics
- understand the concepts of sound

UNIT I

Transmission of heat : Conduction – Co-efficient of the thermal conductivity – Cylindrical flow of heat – determination of thermal conductivity of rubber and bad conductor – Lee's disc method. Conduction – Convection currents in atmosphere – Laps rate – Stability of atmosphere – Green house effect – Experimental Determination of Specific heat of liquid. Radiation – Black body – Wein's Law - Rayleigh Jeans Law – Stefan's law – Experimental Determination of Stefan's constant – Mathematical derivation of Stephan's law – Solar constant – Solar Spectrum – Temperature of the sun

UNIT II

Laws of Thermodynamics: I Law – Isothermal and Adiabatic process – gas equation during an adiabatic process – Work done an adiabatic expansion of gas – equation of an adiabatic curve – isothermal processes – Determination of γ by clement and Desormes method – II law – Carnot's engine- Working efficiency – Carnot refrigerator – Carnot's Theorem.

UNIT III

Conservation Law – Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy – power expression for thrust and velocity – Bancky tracks motion of vertical circle – friction – Laws of friction– angle of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination in greater then the angle of friction.

UNIT IV

Gravitation: Kepler's Law of Planetary motion – Laws of gravitation – Boy's method for G – Expression for period – Expression of field 'g' – gravitational potential – Gravitational field at a point due to spherical shell – Variation of 'g' with latitude altitude and depth.

Elasticity: Elastic modules – Poison's ratio – relation between them – Expression for bending moment – determination of Young's modular by uniform and non-uniform bending I section girders – Static Tension – Expression for couple per unit twist – Torsional oscillation- Determination of E, G and γ by Seasli's method.

UNIT V

Sound: Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties Melde's Experiment for the frequency of

electrically maintained tuning fork – Transverse and longitudinal modes – acoustics – Ultrasonic – Properties and application – Doppler effect.

Text Books

1. Thermal Physics, R. Murugesan, I Edi, 2002
2. Heat & Thermodynamics, Brijlal & N. Subramaniam
3. Properties of Matter – Brijlal. and N. Subramaniam - S Chand & Co
4. Text Book of Sound – Brijlal. and N. Subramaniam - S Chand & Co

Reference Books

1. Heat and Thermodynamics – Sears & Semansky
2. Heat and Thermodynamics – D.S. Mathur, S. Chand & Co, Edi 2002.
3. Heat and Thermodynamics – Agarwal, Singhal, Sathyaprakash
4. Thermal Physics – H.C. Saxena and Agarwal
5. Mechanics, Properties of matter and sound, Thermal Physics – R. Murugesan, Edi 2002.
6. University Physics – Sears Semansky and Ground
7. Text books of Sound - Ghosh
8. Elements of Properties of Matter – D.S. Mathur
9. Mechanics - B.S. Mathur, S. Chand and Co, Edi 2002.

GENERAL PHYSICS II
CORE PAPER II
OPTICS, ELECTRICITY AND MAGNETISM

Subject Description:

This paper presents the basic principle of charged body, when they are in rest and also under motion. This paper gives the knowledge of depth for the students regarding the electrical energy and magnetic energy along with optics.

Goal:

To enable the students in order learn the basic principles theory and concepts of electricity, magnetism and optics.

Objectives

To give the description for the students in order to

- learn motion of charges
- acquire basic knowledge of magnetic properties
- know about the alternating current and its circuits
- get a depth of knowledge in optics.

UNIT I

Reflection and Refraction : Lens – Refraction through lenses – aberration – chromatic aberration – spherical aberration – coma – astigmatism . Ramsdens and Huygens eye piece – Oil immersion objective dispersion trough a prism – Cauchy's dispersion formula – Theory of Rainbows – Primary and secondary rainbow

UNIT II

Interference : Super position of waves – colour of thin films – Air wedge – determination of diameter of thin wire – Newton's ring – determination – of μ of liquid – Michelson interferometer – determination of λ and dλ - uses – Jamin interferometer – Rajleigh Refractometer.

UNIT III

Magnetic Properties of Materials

Electron theory of magnetism; dia, para, ferromagnetism; magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magnetic materials and magnetization; magnetic hysterises area of the hysterises loop; determination of susceptibility : Guoy's method.

UNIT IV

Thermo Electricity: Seebeck effect: Laws of thermo e.m.f; Peltier effect; Peltier Co-efficient, determination of Peltier co-efficient a junction; thermo dynamical consideration of Peltier effect; Thomson effect; Thomson Co-efficient; e.m.f generated in a thermocouple taking both Peltier effect and Thomson effect in the metals; Thermo electric power; Application of thermodynamics to Thermocouple ; Thermoelectric diagrams and their uses.

UNIT V

Helmholtz equation of varying current

Growth and decay of current in an inductive – resistive circuit charging and discharging of a capacitor through a resistance; charging and diacharging of capacitor through an inductance – oscillatory circuits- Force on a current carrying conductor; Theory of Ballistic Galvanometer.

Dynamics of charged particles

Charged particles in a uniform and constant electric field; Charged particles in an alternating electric field; Charging particles in a uniform and constant magnetic field; magnetic focusing; charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction.

Books for Reference

1. Optics and Spectroscopy – R. Murugesan
2. Electricity and Magnetism – Brijlala and Subramaniam
3. Electricity and Magnetism – R. Murugesan
4. Electricity and Magnetism – D.N. Vasudeva
5. Electricity and Magnetism – Nagarathanam and Lakshminarayanan
6. Fundamental of Electricity and Magnetism – B.D.Duggal and C.L. Chhabra
7. Mechanics – D.S. Mathur

II YEAR
CORE PAPER III
MATHEMATICAL PHYSICS

Subject Description :

This paper presents the fundamental of classical mechanics special functions and matrices which will be used for studies solving problems during research work.

Goal:

To enable the students to acquire the problem solving ability and to apply the equations for the situation of different physical problems.

Objectives

To acquire knowledge and apply it to various physical problems

- Various physical problems
- To apply the develop the problem solving ability.
- To motivate the students to apply matrices or solving problems in spectroscopy, nuclear physics etc.,
- To apply vectors to non-linear dynamics

UNIT 1

Classical Mechanics - I

Constraints and Degrees of Freedom – Generalized coordinates – Generalized displacement – Velocity – Acceleration – Momentum – Force – Potential Energy – D'Alembert's Principle – Lagrangians equation from D'Alembert's principle – Application of Lagrange's equation of motion to Linear Harmonic Oscillator, Simple Pendulum and Compound Pendulum.

UNIT 2

Classical Mechanics – II

Phase Space – Hamiltonian function – Hamiltonian Principle – Hamilton's canonical equations of motion- Physical significance of H – Applications of Hamiltonian equations of motion to Simple Pendulum, Compound Pendulum and Linear Harmonic Oscillator.

UNIT 3

Special Functions

Definition – The Beta function – Gamma function – Evaluation of Beta function – Other forms of Beta function – Evaluation of Gamma function – Other forms of Gamma function - Relation between Beta and Gamma functions – Problems.

UNIT4

Matrices

Introduction – special types of Matrices – Transpose of a Matrix – The Conjugate of a Matrix – Conjugate Transpose of a Matrix – Symmetric and Anti symmetric – Hermitian and skew Hermitian – Orthogonal and Unitary Matrices – Properties – Characteristics equation – Roots and characteristics vector – Diagonalization of matrices – Cayley – Hamilton theorem – Problems

UNIT 5

Vector Calculus

∇ Operator – Divergence – Second derivative of Vector functions or fields – The Laplacian Operator – Curl of a Vector – Line Integral – Line Integral of a Vector field around an infinitesimal rectangle – Curl of Conservative field – Surface Integral – Volume Integral (without problem) – Gauss's Divergence theorem and it's proof in the simple problems – Stoke's and its proof with simple problems.

Books for Study and Reference

1.	Mathematical Physics	B D Gupta
2.	Mathematical Physics	Rajput
3.	Classical Mechanics	Gupta Kumar & Sharma
4.	Mathematical Physics	K N Pillai
5.	Mathematical Physics	Sathiya Prakash
6.	Mathematical Physics	H K Dass
7.	Mathematical Physics	Gupta Kumar & Sharma

CORE PRACTICAL - I
(EXAMINATION AT THE END OF SECOND YEAR)

Credit Hours : 3 hours per week

ANY TWELVE EXPERIMENTS ONLY

1. Compound Pendulum.
2. Comparison of Viscosities – Capillary Flow Method
3. Young's Modulus – Non- Uniform bending – Pin and Microscope
4. Young's Modulus – Uniform bending – Optic lever
5. Rigidity modulus – Static Torsion – Scale and Telescope
6. Sonometer – Frequency of A.C.
7. Spectrometer – Refractive index of Solid Prism
8. Resonance Column – Velocity of Sound
9. Moment of magnet – Tan C Position
10. Characteristics of a Junction Diode
11. Spectrometer – (i.d) Curve
12. Air Wedge – Thickness of Wire
13. Field along the axis of a coil – Moment of a Magnet
14. Potentiometer – Specific Resistance of a wire
15. Potentiometer – Low range Ammeter Calibration
16. Young's Modulus – Cantilever – Depression – Scale and Telescope
17. Young's Modulus – Cantilever – Dynamic Method
18. Viscosity by Capillary flow method
19. Melde's Strings – Frequency of Vibrator.

CORE PRACTICAL – II
(Examination at the end of II year)
Any Twelve (12) Experiments only

1. Rigidity Modulus – Torsional Pendulum – With & Without symmetrical masses
2. Quincke's method – Surface Tension and Angle of Contact of Mercury
3. Specific heat capacity – Newton's law of cooling – Spherical calorimeter
4. Spectrometer – Hollow prism – Refractive index of the Prism
5. Determination of M_H and B_H
6. Zener diode - Characteristics
7. Spectrometer – (i – i') curve
8. Newton's rings – Refractive index of a lens
9. Reduction factors of a Tangent Galvanometer - BG
10. Comparison of Mutual Inductance - BG
11. Spectrometer – Grating – Minimum deviation & Normal Incidence
12. Young's Modulus – Koenig's Method – Non Uniform bending
13. Young's Modulus – Koenig's Method – Uniform bending
14. Spectrometer – Cauchy's constant
15. Spectrometer – Dispersive Power
16. Spectrometer – Narrow Angled Prism
17. Carey Foster's Bridge – Temperature Coefficient
18. Potentiometer – Reduction factor of T.G in Primary
19. Potentiometer – EMF of a thermocouple
20. B.G - Absolute Capacity
21. B.G – Determination of High Resistance

III YEAR - CORE PAPER IV
ATOMIC PHYSICS AND NUCLEAR PHYSICS

Subject Description :

This paper presents the fundamentals of formation of nucleus, composition of nucleus with their energy.

Goal:

To enable the students to acquire knowledge of the nuclear energy, fission and fusion with particle accelerator.

Objectives

To acquire knowledge and apply it to

- Study the structure of nucleus
- Know the formation of nucleus and their binding energy
- To motivate the students to analyze the energy released by the nucleus during the fission and fusion process.

UNIT 1 Positive Rays and Structure of the Atom

Positive rays – Discovery – Properties – Positive ray analysis – Thomson's Parabola method – action of Electric and Magnetic fields – Determination of e/m – determination of mass – discovery of stable isotopes– Limitations – Dempster's mass spectrograph –Aston's mass spectrograph- mass defect and packing fraction – polarization of X –rays – scattering of X-rays (Thomson's formula)

The Bohr atom model – Critical Potentials – Method of excitation of atoms – Experimental determination of critical potentials by davis and Goucher;s method - Sommerfield's relativistic model– Vector atom model – Quantum numbers associated with Vector atom model – coupling schemes (LS, JJ coupling) – Pauli's exclusion principle – Periodic classification of elements

UNIT 2 Magneto Optical Properties of Spectrum

Magentic dipole moment due to orbital motion of the electron – Magentic dipole moment due to spin – The Stern and Gerlach experiment – Optical spectra – Fine Structure of the sodium D line – Zeeman effect – Experiments – Lorentz classical theory – Expression for the Zeeman shift – Larmor's theorem – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – Paschen – Back effect – Stark effect –

UNIT 3 - Introduction to the Nucleus

General properties of Nucleus (Size, Mass, Density, Charge, Spin, Angular momentum, Magnetic dipole moment) – Binding energy – BE/A and stability of Nucleus – Packing fraction – Nuclear stability – Nuclear forces – Definition – Properties – Meson theory – Model of Nuclear Structure – The Liquid Drop model – Semi-Empirical mass formula – The Shell model – Evidence for Shell model –The collective model.

UNIT 4 Detector and Particle Accelerators, Radioactivity

Interaction between the energetic particles and matter – Heavy charged particles – Electrons – Gamma ray-Ionization chamber – Solid State detector – GM counter – Wilson Cloud chamber – Nuclear emission – Linear accelerators – Cyclotron – Betaron.

Natural Radioactivity – Alpha, Beta and Gamma rays – Properties – Determination of e/m of Alpha particle – Determination of Charge of Alpha particle – Determination of e/m of Beta particle – determination of Wavelength of Gamma rays (Dumond Spectrometer) – Origin of Gamma rays – Laws of Radioactivity – Soddy-Fajan's displacement law – Law of Radioactive disintegration – Half life period – Mean life period (Definitions, Expression) – Units of Radioactivity – Artificial Radioactivity – Preparation of radio elements – Application of radio isotopes.

UNIT 5 Nuclear Fission and Fusion Reactions

Nuclear fission – Energy released in Fission – Bohr and Wheelers theory of Nuclear fission – Chain reaction – Multiplication factor – Critical size – Natural Uranium and chain reactions – Atom Bomb – Nuclear reactor – Nuclear fusion – Source of Stellar energy – Carbon Nitrogen cycle – Proton-Proton cycle – Hydrogen bomb – Controlled thermo nuclear reactions.

Cosmic rays and Elementary particles

Cosmic rays – Origin of cosmic rays – Latitude effect – Azimuth effect – Attitude effect – Seasonal, Diagonal changes – Primary and Secondary Cosmic rays cascade theory of shower – Pair production and Annihilation – Van Allen Belts – Elementary particles – Introduction – particles and antiparticles – Antimatter – The fundamental interactions – The Quark model.

Book for Study:

1. Modern Physics	R Murugesan

Book for Reference:

1. Nuclear Physics	D C Tayal
2. Concept of Modern Physics	Arthur Beiser
3. Introduction to Modern Physics	F K Richtmyer Etal

III YEAR

CORE PAPER V
QUANTUM MECHANICS AND RELATIVITY

Subject Description :

This paper presents the fundamentals of wave mechanics, Schrödinger's wave equation and its applications.

Goal:

To enable the students to acquire the problem solving ability and to apply the Schrödinger's wave equation for the situation of different physical problems.

Objectives

To acquire knowledge and apply it to

- Various physical problems
- To apply the develop the problem solving ability.
- To motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

UNIT 1- Wave Properties of Matter

Introduction – Phase velocity and Group velocity – Analytical expression for a group of waves – Nature of De'Broglie relation – Derivation of the De'Broglie relation – Phase velocity of De'Broglie waves – Relation between the Phase velocity and the wavelength of De'Broglie wave – De'Broglie wavelength associated with a particle of mass M and kinetic energy – Verification of De'Broglie relation – Davission and Germer's experiments – G P Thomson's experiments.

UNIT 2 - Uncertainty Principle

Introduction – Uncertainty Principle – Elementary proof between – Displacement and Momentum – Energy and Time – Physical Significance of Heisenberg's Uncertainty

Principle – Illustration – Diffraction of electrons through a slit – Gamma ray microscope thought experiment – Application – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom

UNIT 3 - Schrödinger's Wave Equation

Introduction – Wave function for a free particle – Schrödinger's One dimensional wave equation – Time-dependent and Time independent – Physical interpretation - Limitation – Normalization of wave function – Operators – Eigen function – Eigen Value – Eigen equation – Operator for Momentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics – Orthogonality of Energy Eigen function – Proof – Probability current density – Ehruenfest's theorem – Statement and proof.

UNIT 4 - Spherical Symmetrical systems

Three dimensional schrödinger's wave equation –Hydrogen atom – Wave equation for the Motion of a electron – Separation of variables – Azimuthal wave equation and its solution – Radial wave equation and it's solutions – Polar wave equation and its solution – Ground size of the Hydrogen atom.

UNIT 5 – Relativity

Galilean Transformation equation – Ether Hypothesis – Michelson-Morley experiment – Explanation of the Negative results – special theory of Relativity – Lorentz transformation equation – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence.

Books for Study:

1. Quantum Mechanics — S.P Singh and M.K Banda
2. Modern Physics — R Murugesan

Books for Reference:

1. Quantum Mechanics — Schiff
2. Introduction to Modern Physics — F.K Richtmyer Etal

III YEAR
CORE PAPER VI
SOLID STATE PHYSICS

Subject Description :

This paper presents the fundamentals of solids and its bond theory which will be used for studying solids and how they are formed.

Goal:

To enable the students to acquire the knowledge of electrons and their bonds with the external applied force as well as the internal attractive force.

Objectives

To acquire knowledge of

- Various bond theory
- And to know the method of forming different alloys, conducting materials.
- To motivate the students in order to apply the principles of bond theory in their research studies.

UNIT 1

Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravais lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal – Atomic Packing – Atomic radius –-Lattice constant and density- Crystal structure (sc; hcp; fcc;bcc.)

UNIT 2

Bond theory of solids – Classification of solids – Basics of Bond theory – Optical properties of solids – Specific heat capacity of solids – Dulong and Pettit's law – Einstein's theory of specific heat of solids – Fermi levels .

UNIT 3

Magnetic properties of materials : Introduction – Langevin's theory of diamagnetism – Langevin's theory of paramagnetism – Ferromagentism – Weiss theory of Ferromagentism – Nuclear magnetic resonance – Ferro electricity – Ferroelectric crystals – Quantum theory of paramagnetism – Cooking by adiabatic demagnetization of a paramagnetic salt.

UNIT 4

Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity – Wide-Mann and Franz ratio – Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

UNIT 5

Dielectrics- Dielectric constant and displacement vector- Clausiss mossotti relation- Atomic or molecular polarizability – Types of polarizability -Super conductivity – Phenomena – magnetic properties – Super conductor – Meissner effect – Experimental facts – Isotopes effect – Thermodynamic effect.

Books for Study:

1. Solid State Physics Gupta and Kumar
2. Modern Physics R Murugesan

Books for Reference:

1. Introduction to Solid State Physics Charles Kittel
2. Solid State Physics A J Dekker

III YEAR - CORE PAPER VII
APPLIED ELECTRONICS

Subject Description :

This paper presents the fundamentals of electronics and its theory which will be used for studies solving problems during research work.

Goal:

To enable the students to acquire the knowledge of electronics and to apply the principles for the situation of different physical problems.

Objectives

To acquire knowledge and apply it to

- Various electronics instruments
- To apply the development of the electronic instruments.
- To motivate the students to apply the principles of electronics in their day – to – day life.

UNIT 1 – Amplifiers

Voltage and power amplifiers – Classification of amplifiers – Transistor amplifiers in cascade – Power amplifiers – Class A power amplifier – Push Pull connection push pull class B – Power amplifier – Characteristics of an amplifier

Feed back amplifier- feed back and related terms- block diagram of a feed back amplifier- Transfer gain of an amplifier with feedback- Emitter follower circuit - an example of negative feedback.

UNIT 2 – Oscillators

Introduction - Types of oscillators - Fundamental principle of oscillators - Concept of feedback oscillators -Tunned collector oscillators - Analysis - Hartley oscillators –Analysis - Colpitts oscillators –Analysis - Phase shift oscillators-Analysis - Wien bridge oscillator - Analysis - Crystal oscillator – Analysis.

UNIT 3 -- Solid state switching circuits

Introduction - Switching circuit-mechanical switch-limitations - Electromechanically switch or relay - advantages of electronic switches - important terms - Collector leakage current - Saturation collector current - Switching transistors - Switching action transistor – OFF region – ON region – Active Region.

Multivibrator – Types of multivibrator –Transistor Astable multivibrator – circuit details - Operations - ON or OFF time – transistor mono stable multivibrator -Circuit details – operations – transistor Bistable multivibrator - Circuit details – operations.

UNIT 4 -- Wave Shaping Circuits

Differentiating circuit - Output waveforms - Integrating circuit – Output waveforms- Important applications of diodes – Clipping circuit – positive clipper – biased clipper – combinations clipper – applications of clipper- Clamping Circuits-basic idea of a clamper- Positive clamber – Operations – negative clamper.

UNIT 5 -- Power Electronics

Introduction - power electronics - The Triac – Construction - Operations – Characteristics - Applications. The Diac – Operations – Applications of Diac – Lamp dimmer heat control. Uni junction transistor – Constructions – Operations - equivalent circuit of UJT – Characteristics of UJT - advantages of UJT – UJT relaxations Oscillator - UJT over voltage detector.

Book for Study and Reference

1. Foundation of Electronics D Chattopadhyaya & R C Raksjti
2. Principles of Electronics V K Metha
3. Applied Electronics R S Sedha
4. Integrated Electronics Millman and Halkias
5. Electronics devises and Circuits Millman and Halkias.

CORE PRACTICAL – III :
ELECTRONICS PRACTICAL
(EXAMINATION AT THE END OF III YEAR)
ANY TWELVE (12) EXPERIMENTS ONLY

1. Bistable Multivibrator
2. R.C. Coupled Amplifier – Transistor single stage
3. Hartley Oscillator – Solid State
4. Colpitt's Oscillator – Solid State
5. Tuned Plate Oscillator
6. Tuned Grid Oscillator
7. Astable Multivibrator
8. Series and Parallel resonance circuits
9. Differential Circuit and Integrating Circuit
10. Clipping and Clamping Circuits
11. Study of Solar Cell
12. Logic Gates – Discrete components
13. Emitter Follower
14. IC – Regulated Power Supply
15. Transistor – Regulated Power Supply
16. Dual Power Supply
17. Square wave generator using 555 IC
18. Study of LDR
19. UJT Characteristics
20. Bridge rectifier with voltage regulation
21. Junction diode & Zener diode Characteristics

CORE PRACTICAL – IV
(EXAMINATION AT THE END OF III YEAR)
ANY TWELVE (12) EXPERIMENTS ONLY

1. Verification of Truth tables of IC gates: OR, AND, NOT, XOR, NOR and NAND.
2. NAND as universal building block- AND, OR, NOT
3. Verification of De Morgan's theorem.
4. Boolean Algebra –problem solving
5. Study of RS Flip-Flop.
6. Study of Shift –Registers –Serial in Parallel out.
7. Decade counter using 7490.
8. Half adder.
9. Full adder
10. Half Subtractor and Full Subtractor.
11. 4 BIT – Binary Adder & Subtractor using 7483.
12. Code converter (Binary to gray and vice versa) & Seven segment Decoder
13. Binary Counter using 7493.
14. Parity check logic.
15. Up/Down Counter using 74190
16. 8085 ALP for 8 bit Addition and Subtraction
17. 8085 ALP for One's Complement, Masking off most significant 4 bits and setting bits.
18. 8085 ALP for Two's compliment Addition and Subtraction
19. 8085 ALP for 8 Bit Multiplication and Division
20. 8085 ALP for finding the Biggest number element in the array and Sum of the elements in the Array

BHARATHIAR UNIVERSITY – COIMBATORE- 641 046.

Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

First Year

Part-III-Branch III-**PHYSICS**

HEAT, THERMO DYNAMICS, MECHANICS, PROPERTIES OF MATTER AND SOUND

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a) Describe Joly's method to find specific heat capacity at constant volume
   b) Describe callender and Barne's method to find specific heat capacity at constant pressure.
2. a) Describe Lee's disc method to determine thermal conductivity of bad conductor.
   b) Discuss an experimental determination of Stefan's constant.
3. a) Explain Isothermal and adiabatic process
   b) State Carnot's theorem and explain the function of Carnot engine.
4. a) Describe the oblique impact. Find the final velocity and loss of kinetic energy in the above case.
   b) Obtain an expression for thrust and velocity.
5. a) State the loss of friction. Define angle of friction and cone of friction.
   b) Derive an expression for equilibrium for a body on a rolling down an inclined plane to horizontal.
6. a) Describe an experiment to determine 'G' by Boy's method with necessary theory.
   b) Explain the variation of 'g' with latitude and depth.
7. a) Describe an experiment to find the young's modulus by uniform bending.
   b) Define Poison's ratio obtain the relation between the modulus.
8. a) Describe how ultrasonic waves are produced. Explain the application of ultrasonics.
   b) Describe Mede's experiment to determine frequency of fork using traverse and longitudinal modes.

BHARATHIAR UNIVERSITY – COIMBATORE- 641 046.

Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

First Year

Part-III-Branch III-**PHYSICS**

OPTICS, ELECTRICITY AND MAGNETISM

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a) Define dispersion and deviation in Prison. Describe the combination of two prisms to produce
   (i) dispersion without deviation
   (ii) deviation without dispersion
   b) Obtain Cauchy's dispersion formula.
2. a) What do you understand by achromation of lenses. Discuss the condition for achromatism of two lenses separated by a finite distance.
   b) Write a note on Astigmatism.
3. a) Explain the principle of Super position of waves.
   b) What are Newton's rings? How are they formed. Explain with theory how would you determine the refractive index of liquid by forming these fringes
4. a. Define capacity of a conductor. Obtain an expression for energy of charged conductor and also obtain an expression for the system of conductors connected by wire.
   b. Obtain an expression for the capacity of spherical conductor and parallel plate condenser?
5. a. What is meant by susceptibility and permeability.
   b. Explain what is meant by residual magnetism, coercive forces and hysterisis? Prove that the I-H cycle denotes the energy dissipated per – m3 of metal during the cycle.
6. a. Describe the principle and the theory of Thomson effect. b. What is thermoelectric power? What are the applications of thermodynamics to a thermocouple.
7. a. Give the principle and theory of moving B.G. and obtain the damping correction
   b. Obtain the equation for discharging of a capacitor through a resistor.
8. a. Discuss the motion of a charged particle in crossed electric and magnetic field.
   b. Explain magnetic focusing.

BHARATHIAR UNIVERSITY – COIMBATORE- 641 046.

Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

Second Year

Part-III-Branch III-**PHYSICS**

MATHEMATICAL PHYSICS

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a) Explain generalized coordinates. Derive Lagrange's equation.
   b) Discuss the problem of Linear harmonic oscillator by Lagrange's approach.
2. a) Using Hamillonian equation of motion obtain the period of oscillation of a compound pendulum.
   b) Define phase space. Obtain Hamilton's canonical equation of motion.
3. a) Prove that $\beta\left(m,\frac{1}{2}\right) = 2^{2m-1}\ \beta\,(m,m)$. Hence find $\Gamma(2m)$
   b) Prove that $\beta(m,n) = \beta(n,m)$
4. a) (i) Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ (ii) Evaluate $\int_0^1 \frac{dx}{\sqrt[n]{1-x^n}}$

   b) Prove that $\beta(m,n) = \frac{\Gamma m\ \Gamma n}{\Gamma m+n}$
5. a) Prove that the Eigen values of Hermitian matrix are real
   b) If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ prove that A.(adj A) = (adj A). A
6. a) Find the characteristics equation of the matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$ and hence find. A^{-1}.

   b) Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 1 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$
7. a) State and prove Guass Divergence Theorem.
   b) a) Given $V = \frac{x\vec{i} + y\vec{j}}{x+y}$ find V.V
8. a) Prove that $V = 3y^4z^2\ \vec{i} + 4x^3z^2\ \vec{j} - 3x^2y^2\vec{k}$ is a solenoidal vector.
   b) State and prove Stoke's Theorem.

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Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

Third Year

Part-III-Branch III-**PHYSICS**

ATOMIC PHYSICS AND NUCLEAR PHYSICS

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a) Describe Thomson's parabola method for positive ray analysis. Discuss the limitations
   b) Explain the properties of positive rays.
2. a) Write a note the discovery of Isotopes.
   b) Describe the detail Aston's man spectrograph and its use in detection of isotopes
3. a) Give an account of Bohr's atom model
   b) State Paul's exclusion principle. Describe the classification of elements based on this theory.
4. a) Explain in detail anomalous Zeeman effect, with necessary theory.
   b) What do you mean by Stark effect. Explain the relevant experiment. Discuss its results
5. a) Explain the general properties of Nucleus.
   b) Discuss the cell model of nucleus and explain its properties
6. a) Describe the Ionisation chamber with a diagram and explain its working.
   b) Explain the action of a Cyclotron. If a cyclotron is adjusted to give a proton beam, the magnetic field is 15000 Gauss and extreme radius is 15 cm. Calculate the energies in eV of the emergent protons and the wavelength of the oscillator.
7. a) Describe the Dumond spectrometer to measure the wave length of gamma rays.
   b. Explain artificial radioactivity and write the application of radio isotopes.
8. a) Describe Primary and Secondary Cosmic rays.
   b) Explain the function of Atom bomb and Hydrogen Bomb with an equation.

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Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

Third Year

Part-III-Branch III-**PHYSICS**

QUANTUM MECHANICS AND RELATIVITY

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a. State three reasons for the failure of classical mechanics
   b. Describe G.P. Thomson's experiment on existence of electron waves.
2. a. Give the elementary proof of uncertainty principle
   b. Illustrate uncertainty principle by two thought expts
3. a. Obtain i) size of hydrogen atom ii) energy of hydrogen atom in ground state using uncertainty principle
   b. Show that electrons cannot be present inside the nucleus
4. a. Define probability current density
   b. Explain the concept of operators in quantum mechanics with examples
5. a. What are degenerate states? Give example
   b. Solve the schgrodinger equation for particle in a rectangular three dimensional box and obtain the eigen values
6. a. Obtain the solution of polar wave equation for hydrogen atom.
   b. Write down the azimuthal part of the wave equation of hydrogen atom.
7. a. Show that acceleration is invariant under Galilean transformation
   b. Explain Michel – Morely experiment. How is the 'negative' result explained?
8. a. Derive the relation, $m = \frac{m_o}{\sqrt{1-\frac{v^2}{c^2}}}$ and explain its consequences.
   b. Explain the physical significance of the Mass energy equivalence.

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Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

Third Year

Part-III-Branch III-**PHYSICS**

SOLID STATE PHYSICS

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions
All Question Carry Equal Marks

1. a. Explain the term symmetry in crystal structure. Show that a five fold symmetry is not possible in crystal structures.
   b. Explain miller indices. How will you determine them?
2. a. Describe the structures of sodium chloride crystal and distinguish between atom sites and lattice points in a mono atomic fcc crystal and NaCl crystal.
   b. i) Define the terms 1. unit cell 2. space lattices 3. miller indices.
   ii) sketch the planes (111), (212)
3. a. Discuss the classical theory of specific heat of solids
   b. Explain Einstein's theory of specific heat of solids
4. a. i) Give optical properties of solids
   ii) What is Fermi level-Explain
   b. Give a brief note on energy bands in solids.
5. a. Deduce Wiedmann Franz law.
   b. Explain in detail about thermal conductivity and derive an expression for the coefficient of thermal conductivity k
6. a. Explain Dia magnetism and give the properties of dia magnetic materials.
   b. Distinguish between dia , para ,ferro and ferri magnetic materials. Mention their applications
7. a. Deduce Clausius Mosotti relation
   b. Write short notes on
   i) Meissner's effect ii) Josephson effect
   iii) Squids and their applications iv)Magnetic levitation
8. a. Explain
   i) Isotopes effect ii) Thermodynamic effect.
   b. Explain super conductivity

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Model Question Paper

[For the candidates admitted from 2007-2008 onwards]

B.Sc DEGREE EXAMINATION (SDE)

Third Year Part-III-Branch III-**PHYSICS**

APPLIED ELECTRONICS

Time : Three Hours **Maximum : 100 marks**

Answer Any Five Questions - All Question Carry Equal Marks

1. a) Draw the circuit of practical single stage transistor amplifier. Explain the function of each component.
   b) Draw neatly the configuration of push- pull amplifier and explain its working.
   Derive an expression for its efficiency.
2. a) What is an oscillator? What is its need? Discuss the advantage of oscillators?
   b) Draw a circuit diagram of the transistorized colpitts oscillator with suitable equivalent circuit. Give the expression for the following:
   (i) frequency of oscillations, and
   (ii) minimum gain for sustained oscillations
3. a) Explain the construction and working of a JFET?
   b) (i) Explain the switching action of transistor.
   (ii) How a schmitt trigger is different from a multivibrator?
4. a) Explain the terms collector leakage current and saturation collector current.
   b) (i) Explain the switching action of transistor.
   (ii) How a schmitt trigger is different from a multivibrator?
5. a) (i) With a neat sketch, explain the operation of a bistable multivibrator.
   (ii)Determine the period and frequency of oscillation for an astable multivibrator with component values of $R_1 = R_2 = 4.7k\Omega$ and $C_1 = C_2 = 270$ pF.
   b) What is the basic difference among the three types of multivibrators.
6. a) (i) Show by drawing the neat waveforms a to how we can generate
   (I). narrow pulses from square wave, and
   (II) square wave from triangular wave
   (ii) Enumerate the conditions under which an RC circuit behaves as an integrator
   b) What do you mean by the term "wave shaping"? also discuss why it is needed in practical applications.
7. a) (i) With the help of circuit diagram describe the operation of a clipper that can clip at two independent levels. Choose a suitable waveform for clipper description. Explain how the two clipping levels can be controlled independently.
   b) Sketch out the waves forms for an integrating circuit when the input signal is (i) Square wave and (ii) a rectangular wave
8. a) Explain the construction and working of a diac?
   b) (i) Explain the construction and working of a Triac
   (ii) Explain the V- I characteristics of diac.
   c) The 2N5431 UJT has a rating of $\eta = 0.8\,(\max)$. Determine the maximum value of V_P for the device when it is being used in the circuit with $V_{BB} = +18$V. Take $V_D = 0.7$ V.