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| **Annexure No.** | **22 A** |
| **SCAA Dated** | **29.02.2008** |

**BHARATHIAR UNIVERSITY, COIMBATORE**
**REGULATIONS FOR B.Sc. PHYSICS DEGREE PHYSICS COURSE WITH COMPULSORY DIPLOMA (SEMESTER SYSTEM)**

**1. Eligibility for admission to the course**

Candidate for admission to the first year of the **B.Sc. Physics** (with Physics and Mathematics) degree course shall be required to have passed the higher secondary examination (Academic) conducted by the Govt. of Tamil Nadu other examinations accepted as equivalent there to by the syndicate, subject to such other conditions as may be prescribed therefore.

**2. Duration of the course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

**3. Course of study**

The course of study for the UG degree course of Branch III Physics shall consist of the following

**a) Part – I**

Tamil or any one of the following modern / classical languages i.e., Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu

The subject shall be offered during the first four semesters with one examination at the end of each semester.

**b) Part – II : English**

The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

**c) Foundation Course**

The foundation course shall be comprise of two stages as follows:

Foundation Course A : General Awareness ( I & II semesters)

Foundation Course B : Environmental and Studies (III & IV Semesters)

1. The syllabus and scheme of examination for the foundation course A. General awareness shall be appointed as follows.
   From the printed material supplied by the university - 75%
   Current affairs & Who is who? - 25%
   The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the university
2. The Foundation course B shall comprise of only one paper which shall have Environmental Studies

**d) Part – III**

**Group A :** Core subject – As prescribed in the scheme of examination

Examination will be conducted in the core subjects at the end of every semester

**Group B :** Allied subjects – 2 Subjects – 4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters

**Group C :** Application oriented subjects : 2 subjects – 4 papers
The application – Oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters

**Group D :** Field work / Institutional Training
Every student shall be required to undergo field work / institutional training, related to the application – oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student has satisfactorily undergone the field work / institutional training for the prescribed period.

**Diploma Programme**

The UG Physics programme shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V & VI semesters

**e) Co –Curricular Activities: NSS / NCC / Physical Education**

Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student's performance in the respective field and shall the student in the five points scale as follows
A – Exemplary
B – Very good
C – Good
D – Fair
E – Satisfactory
This grading shall be incorporated in the marksheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester)
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of nay one of the above 3 field and be graded and certified accordingly)

**4. Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
i) He / She secures not less than 75% attendance in the number of working days during the semester
ii) He / she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
iii) His / her conduct has bee satisfactory

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester

c) A candidate who as secured less than 55% of attendance in any semester will not be permitted to appear for the regular examination and to continue the study in the subsequent semester. HE / she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/ her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

**5. Restrictions to appear for the examination**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers

b) Candidates who fail in any of the papers in Part I,II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and shows they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts / syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a charge in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation / curriculum for the award of the degree.

**6. Medium of instruction and examination**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects the medium of instruction shall be either Tamil or English and the medium of examinations is in English / Tamil irrespective of the medium of instructions.

**7. Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examination, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations provided the concerned Head of the Department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

**8. Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation course (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or practical)

b) A candidate who passes the examinations in all subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination

**9. Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

**10. Classification of successful candidates**

a) A candidate who passes all the Part II examination in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.Sc (Physics) degree examination in First Class with Distinctions

b) i) A candidate who passes all the examinations in Part I and Part II or Part III or Diploma securing not less than 60 percent of total marks for concerned part shall be declared to have passed that part in **First class**

ii) A candidate who passed all the examination in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**.

iii) All Other successful candidate shall be declared to have passed the Part I and Part II or Part III or Diploma examination in **Third Class**.

**11. Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she

i) Has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by / affiliated to the university or has been exempted form in the manner prescribed and has passed the examinations as have been prescribed therefore.

ii) Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution

iii) Has successfully completed the prescribed Field Work / Institutional Training as evidenced by certificates issued by the Principal of the College.

**12. Ranking**

A candidate who qualifies for the UG Physics degree course passing all the examinational in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking

**13. Additional degree**

Any candidate who wished to obtain additional UG degree not involving any practical shall be permitted to so and such candidate shall join a college in the III year of the course and he / she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be [permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for

Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-

**14. Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening colleges also.

**15. Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper / subject

**16. Revision of Regulation and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without change for a minimum period of three years from the date of approval of the Regulations. The University may revise / amend / change the Regulations and Scheme of Examinations, if found necessary.

**17. Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e., up to an inclusive of the Examinations of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.

**BHARATHIAR UNIVERSITY**

**B.Sc PHYSICS WITH COMPULSORY DIPLOMA**

**For the students admitted during the academic year 2007-2008 Batch and Onwards Regular Course**

| Subject Title | | Instruction Hours / Week | University Exam | |
|---|---|---|---|---|
| | | | Duration in Hours | Max. Marks |
| **Semester :1** | | | | |
| Language : | Tamil Paper I | 6 | 3 | 100 |
| Language : | English Paper I | 6 | 3 | 100 |
| | Foundation Course A | 2 | | |
| GrA Core | | | | |
| Paper I | Heat and Thermodynamics | 3 | 3 | 100 |
| Paper II | Mechanics, Properties of Matter and Acoustics | 3 | 3 | 100 |
| | Major Practical I | 3 | | |
| Gr B Allied A | | | | |
| | Mathematical Paper I or | 7 | 3 | 100 / |
| | Chemistry Theory | 4 | 3 | 75 |
| | Allied Practical | 3 | | |
| **Semester : 2** | | | | |
| Language : | Tamil Paper II | 6 | 3 | 100 |
| Language : | English Paper II | 6 | 3 | 100 |
| | Foundation Course A | 2 | 3 | 100 |
| GrA Core | | | | |
| Paper III | Electricity and Magnetism | 6 | 3 | 100 |
| | Major Practical I | 3 | 3 | 100 |
| Gr B Allied A | | | | |
| | Mathematical Paper II or | 7 | 3 | 100 / |
| | Chemistry Theory II | 4 | 3 | 75 |
| | Allied Practical | 3 | 3 | 50 |
| **Semester : 3** | | | | |
| Language : | Tamil Paper III | 6 | 3 | 100 |
| Language : | English Paper III | 6 | 3 | 100 |
| | Foundation Course B | 2 | | |
| GrA Core | | | | |
| Paper IV | Optics | 4 | 3 | 100 |
| | Major Practical II | 2 | | |
| Gr B Allied A | | | | |
| | Mathematical Paper I or | 7 | 3 | 100 / |
| | Chemistry Theory | 4 | 3 | 75 |
| | Allied Practical | 3 | | |
| | Diploma - Instrumentation I | 3 | 3 | 100 |
| | | | | |

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|---|---|---|---|---|
| **Semester : 4** | | | | |
| Language : | Tamil Paper IV | 6 | 3 | 100 |
| Language : | English Paper IV | 6 | 3 | 100 |
| | Foundation Course B | 2 | 3 | 100 |
| GrA Core | | | | |
| Paper V | Atomic Physics and Spectroscopy | 4 | 3 | 100 |
| | Major Practical II | 2 | 3 | 100 |
| Gr B Allied B | | | | |
| | Mathematical Paper II or<br>Chemistry Theory II | 7<br>4 | 3<br>3 | 100 /<br>75 |
| | Allied Practical | 3 | 3 | 50 |
| | Diploma Paper - Instrumentation II | 3 | 3 | 100 |
| | | | | |
| **Semester : 5** | | | | |
| GrA Core | | | | |
| Paper VI | Part II : Major Core : Mathematical Physics | 5 | 3 | 100 |
| Paper VII | Applied Electronics | 5 | 3 | 100 |
| Paper VIII | Solid State Physics | 4 | 3 | 100 |
| | Major Practical III - Electronics Alone | 2 | | |
| | Major Practical IV - Digital and Micro Processor | 2 | | |
| GrC App Ori Sub A | | | | |
| | Principles of Digital Electronics | 3 | 3 | 75 |
| | Principles of Programming Concepts and C Programming | 4 | 3 | 75 |
| | AOS Practical - C and C++ | 2 | | |
| | Diploma Paper III - Instrumentation III | 3 | 3 | 100 |
| **Semester : 6** | | | | |
| GrA Core | | | | |
| Paper IX | Quantum Mechanics and Relativity | 6 | 3 | 100 |
| Paper X | Nuclear Physics | 6 | 3 | 100 |
| | Major Practical III - Electronics Alone | 2 | 3 | 100 |
| | Major Practical IV - Digital and Micro Processor | 2 | 3 | 100 |
| GrC App Ori Sub B | | | | |
| | Micro Processors | 4 | 3 | 75 |
| | Object Oriented Programming in C++ | 5 | 3 | 75 |
| | AOS Practical - C and C++ | 2 | 3 | 100 |
| | Diploma Practical | 3 | 3 | 100 |

## SEMESTER – I
## CORE PAPER I - HEAT AND THERMO DYNAMICS

**No. of Credit Hours : 3 per week**

**Subject Description :** This paper presents the principle of heat and Thermo dynamics.

**Goal:** To enable the students in order to learn the basic principles and concepts of Heat and Thermodynamics

**Objectives**

The aims is to provide the students

- To understand the principles of calorimetry
- understand the basic principle and laws of thermodynamics
- understand the concepts of entropy

**UNIT I** **(9 hrs)**

Definitions – Newton's law of cooling – specific heat of a liquid calendar and Barne's continuous flow method – two specific heats of a gas – specific heat of a gas by Joly's differential steam calorimeter – Regnault's method – Dulong and Petit's law – variation of specific heat ad atomic heat with temperature.

**UNIT II** **(9 hrs)**

**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 – Radiation – Black body – Wein's Law - Raleigh – Jean's Law – Stefan's law – Experimental Determination of Stefan's constant – Mathematical derivation of Stefan's law

**UNIT III** **(9 hrs)**

**Kinetic theory of gases:** Maxwell's law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – diffusion – viscosity and thermal conduction of gases – Vander walls equation – relation between Vander Wall's constant and critical constants.

**UNIT IV** **(9 hrs)**

**Laws of Thermodynamics:** First law of thermodynamics – 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 $\gamma$ by Clement and Desorme's method – second law of thermodynamics – Carnot's engine- Working efficiency – Carnot's refrigerator – Carnot's Theorem.

**UNIT V** **(9 hrs)**

**Concept of entropy:** Entropy Change in entropy in a reversible process and irreversible process – temperature entropy diagram – Entropy of a perfect gas – increase of entropy in any irreversible process – Thermo dynamics functions – Maxwell's thermodynamics relations and applications – Joule – Kelvin effect (theory)- Claussius and Clapeyron equation.

**Books for Study**

1. Thermal Physics, R. Murugesan, I Edi, 2002
2. Heat & Thermodynamics, Brijlal & N. Subramaniam
3. Heat – M. Narayanamurthi and N. Nagaratnam

**Reference Books**

1. Heat and Thermodynamics – Zemansky and R.H. Dcltanann
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

## SEMESTER – I
## CORE PAPER II - MECHANICS, PROPERTIES OF MATTER AND SOUND

**No. of Credit Hours: 3 per week**

**Subject Description:** This paper presents the principle of motion of rigid bodies, liquids and knowledge sound energy.

**Goal:** To enable the students in order to learn the basic principles, theory and concepts of matters, sound and mechanics.

**Objectives**

To gain knowledge by the students in order to

- learn motion of bodies and sound waves
- acquire basic knowledge of mechanics, properties of matter and gravitation
- know how to apply the conservation of rotational motion

**UNIT I** **(9 hrs)**

**Conservation Law** – Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws 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 II** **(9 hrs)**

**Motion of rigid body**

Moment of inertia – Parallel and perpendicular axes theorem – M.I. of rectangular Lamina and triangular lamina – M. I of a solid sphere about an axis through it C.G. – Compound pendulum – torque and angular momentum – Relation – Kinetic rotation – conservation of angular momentum

**UNIT III** **(9 hrs)**

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

**Elasticity:** Elastic modules – Poisson's ratio – relation between them – Expression for bending moment – determination of Young's modulus by uniform and non-uniform bending I section girders – Static Torsion – Expression for couple per unit twist – Torsional oscillation.

**UNIT IV** **(9 hrs)**

**Surface Tension:** Definition and dimension of surface Tension – Excess of Pressure over a curved surface – Variation of S.T. with temperature – Jaeser's Experiment.

**Viscosity:** Definition – Rotation viscometer- viscosity of gases, Meyer's Modification of Poiseuille's formula – Rankine's method for viscosity of a gas.

**UNIT V** **(9 hrs)**

**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 – Ultrasonic – Properties and application.

**Text Books**

1. Properties of Matter – Brijlal. and N. Subramaniam - S Chand & Co
2. Text Book of Sound – Brijlal. and N. Subramaniam - S Chand & Co

**Reference Books**

1. Mechanics, Properties of matter and sound, Thermal Physics – Murugesan, Edi 2002.
2. University Physics – Sears Semansky and Ground
3. Text books of Sound - Ghosh
4. Elements of Properties of Matter – D.S. Mathur
5. Mechanics - B.S. Mathur, S. Chand and Co, Edi 2002.

## SEMESTER – II
## CORE PAPER III - ELECTRICITY AND MAGNETISM

**No. of Credit Hours: 6 per week**

**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 regarding the electrical energy and magnetic energy.

**Goal:** To enable the students in order to learn the basic principles theory and concepts of electricity and magnetism.

**Objective**

To gain knowledge about the electrical energies 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 electricity and magnetism

**UNIT I** **(18 hrs)**

**Gauss theorem and its applications**

Normal electric induction Gauss theorem, application of guass theorem - Electric intensity at a point immediately adjacent to a charged conductor - Energy stored in unit volume of an electric field .

**Capacitance and Capacitors**

Spherical capacitor: Cylindrical capacitor, Force of attraction between charged plates of a capacitor – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates – Guard ring condenser - polarization in dielectric materials.

**UNIT II** **(18 hrs)**

**Magnetic Properties of materials**

Electron theory of magnetism; dia, para, ferromagnetism and their properties magnetic field B; magnetization M; magnetic field intensity H; magnetic susceptibility and magnetic permeability; magnetic materials and magnetization; magnetic hysterisis – area of the hysterisis loop; determination of susceptibility : Guoy's method – magnetic circuits – circuits comparison of magnetic application with electrical circuits.

**UNIT III** **(18 hrs)**

**Thermo Electricity :** Seebeck effect – Laws of thermo e.m.f – Peltier effect; Peltier Co-efficient – determination of Peltier co-efficient – 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 IV** **(18 hrs)**

**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.

**UNIT V** **(18 hrs)**

**Dynamics of charged particles**

Charged particles in a uniform and constant electric field – Charged particles in an alternating electric field – Charged 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.

A conducting rod moving through a uniform magnetic field – inductance in series – in parallel – self inductance of coaxial cylinders – self inductance of toroidal coil of rectangular cross section – circular cross section – Grassot fluxmeter – comparison with Ballistic galvanometer – rotating magnetic field.

**Books for Study**

1. Electricity and Magnetism – Brijlala and Subramaniam
2. Electricity and Magnetism – R. Murugesan

**Books for Reference**

1. Electricity and Magnetism – D.N. Vasudeva
2. Electricity and Magnetism – Nagarathanam and Lakshminarayanan
3. Fundamental of Electricity and Magnetism – B.D.Duggal and C.L. Chhabra
4. Mechanics – D.S. Mathur

## CORE PRACTICAL I
## (EXAMINATION AT THE END OF SECOND SEMESTER)

**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.

## SEMESTER - III
## CORE PAPER IV - OPTICS

**No. of Credit Hours : 4 hours per week**

**Subject Description** To study the optical instrument, objects in images, propagation of light, nature and behaviour of light, vibration of light laser and its application

**Goal and objectives**

To provide a good foundation in optics

To provide a knowledge of the behaviour of light

To inspire interest for the knowledge of concepts is physical and geometrical optics

**UNIT 1 - Geometrical Optics (12 hrs)**

Aberrations - Spherical aberrations in lens - coma - Astigmatism - chromatic aberration - dispersion by a prism - Cauchy's dispersion formula - dispersive power, achromatism in prism - deviation without dispersion - chromatic aberrations in a lens - circle of least confusion - achromatic lens - condition for achromatism of two thin lenses separated by a finite distances.

**Physical Optics**

**UNIT 2 Interference (12 hrs)**

Fresnel's Biprism – Interference in thin films due to reflected light – Fringes due to wedge shaped thin film – Newton's rings – Refractive index of the Liquid – Michelson interferometer – Determination of a wave length of monochromatic light – difference in Wave length between two neighboring spectral lines – Fabry Perot Interferometer.

**UNIT 3 Diffraction (12 hrs)**

Fresnel's assumptions – rectilinear propagation of light – half period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersive power of Grating.

**UNIT 4 Polarization (12 hrs)**

Double Refraction – Huygen's explanation --Optic axis in the plane of incidence, inclined and perpendicular to the crystal surface – Production and Detection of Plane, Circularly and Elliptically Polarized light – Optical Activity – Fresnel's explanation – Specific rotation – Half Shade Polarimeter.

**UNIT 5 Quantum Optics (12 hrs)**

Light quanta and their origin – Resonance radiation – Metastable states – Population Inverse – Optical pumping – Spontaneous and Stimulated emission – Einstein's coefficient – Ruby, He-Ne, $CO_2$ laser – Resonant cavities – elements of non linear optics – second harmonic generation – threshold condition for laser – Stimulated Raman scattering.

**Books for Study**

1. A Text book of Optics — Brijlal & Subramaniam
2. Modern Physic — R Murugesan

**Books for Reference**

3. Optics and Spectroscopy — R Murugesan
4. Optoelectronics — Thiyagarajan

**SEMESTER – III**

DIPLOMA PAPER I -INSTRUMENTATION I

**Subject Description**

To study the instrument with its principle and observe the method their functioning

**Goal and objectives**

- ✓ To provide a good foundation in measurements
- ✓ To provide a knowledge of the behaviour of instruments
- ✓ To inspire interest for the knowledge of concepts regarding measurements

**UNIT 1** **(9 hrs)**

**Basic Concept of Measurement**

Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration

**Transducers**

Capacitive transducers – Piezoelectric transducers – Photoelectric effect – Photoconductive transducers – Ionization transducers – Hall effect transducers – Digital displacement transducer.

**UNIT 2** **(9 hrs)**

**Performance Characteristics of an Instrumentation system**

Introduction – Generalized measurement – Zero order system – Second order system – Dead time element – Specification and testing of dynamic response.

**UNIT 3** **(9 hrs)**

**Pressure Measurement**

Mechanical Pressure measurement devices – Bourdon tube Pressure gauge – The Bridgeman gauge – Dead weight tester – Low Pressure measurement – The Mc lead gauge – Pirani thermal conducting gauge- The Knudsen gauge.

**Unit 4** **(9 hrs)**

**Flow Measurement**

Positive displacement methods – Flow Obstruction methods – Flow measurement by drag effects – Hot wire and Hot film anemometers – Magnetic flow meters – Flow visualization methods – The Shadow graph

**Unit 5** **(9 hrs)**

**Measurement of Temperature**

Temperature scales – The ideal gas thermometer – temperature measurements by mechanical effects – temperature measurements – Thermisters – Thermoeletric effects – quartz crystal thermometer – liquid crystal thermography.

**Book for Study**

Unit 1 & 2: Instrumentation Devices and Systems –
C S Rangan, G R Sharma, V S V Mani TMH.

Unit 3 & 4: Experimental Methods for Engineers – Jacy P Hofman, TMH.

Unit 5 : Experimental methods for experiments by Jack P Holman

**SEMESTER – IV**

CORE PAPER V -ATOMIC PHYSICS AND SPECTROSCOPY

**No. of credit hours : 4 hours per week**

**Subject Description**

Analysis of positive rays, Isotopes, atomic structures, models in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, X –rays and their diffraction.

**Goals and Objectives**

- ✓ To provide a detailed study of atom
- ✓ To learn the impact of magnetic fields on spectra
- ✓ To learn the behaviour of atom in various states
- ✓ To provide a knowledge of the application of observed theories

**UNIT 1 Positive Rays (12 Hrs)**

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)

**UNIT 2 Structure of the Atom (12 Hrs)**

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 3 Magneto Optical Properties of Spectrum (12 Hrs)**

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 4 Photoelectric Effect (12 Hrs)**

Introduction – Richardson and Compton experiment – Relation between Photoelectric current and retarding potentials – Relation between Velocity of Photo electrons and the frequency of light – Laws of Photoelectric emission – Failure of electromagnetic theory – Einstein's Photo electric equation – Experimental verification – Millikan's Experiments – Photo electric cells – Photo emission cell – Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cell.

**UNIT 5 X-ray Spectra (12 Hrs)**

X-ray – Coolidge tubes – Properties – X-ray Spectra – Continuous and characteristics X-ray spectrum – Mosley's law (Statement, Explanation and Importance) – Compton effect – Expression for change of wave length - X-ray diffraction-Bragg's law- Bragg's spectrometer-Powder crystal method – Quantum theory – The distribution of energy in the spectrum of a black body – its results planck's hypothesis – derivation of planck's law of radiation.

**Book for Study:**

1. Modern Physics R Murugesan (S. Chand & Company)

**Books for Reference**

1. Modern Physics Sehgal Chopra Sehgal
2. Source book on Atomic Energy Galsstons (S)
3. Atomic Physics Rajam
4. Introduction to Atomic Spectra White (HE)

## CORE PRACTICAL – II

**(Examination at the end of Fourth Semester)**

**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

**SEMESTER – IV**

DIPLOMA PAPER -INSTRUMENTATION II

**No. of Credit Hours : 3 Hours**

**Subject Description** To study the instrument with its principle and observe the method of their functioning

**Goal and objectives**

- ✓ To provide a good foundation in measurements
- ✓ To provide a knowledge of the behaviour of instruments
- ✓ To inspire interest for the knowledge of concepts regarding measurements

**UNIT 1** **(9 Hrs)**

**Temperature Measurement by Radiation:**

Effects of heat transfer and temperature measurements – Transient response of thermal systems – Thermocouple compensation – Temperature measurement flow in high speed flow.

**Thermal and transport property Measurement.**

Thermal conductivity measurements – Thermal conductivity of liquids and gases – Gas diffusion – Calorimeter – Convection – heat transfer measurements – Humidity measurements – Heat flex meter – pH measurements.

**UNIT 2** **(9 Hrs)**

**Force, Torque and Strain Measurements**

Introduction – Mass balance measurements – Elastic elements for force measurements – Torque measurement – Stress and Strain measurements – Electrical resistance – strain gauges – Temperature compensation.

**UNIT 3** **(9 Hrs)**

**Vibration**

Random Vibration – Shock – Analyzing vibration sensing devices – Generalized second order system – Absolute displacement – Absolute velocity and acceleration vibrating sensing devices – Velocity transducer – Banded strain gauge accelerators – Piezo electric accelerometer.

**UNIT 4** **(9 Hrs)**

**Thermal and Nuclear Radiation Measurements**

Introduction – Detection of thermal radiation – Measurement of emissivity – Reflectivity and Transmitting measurements – Solar radiation measurements – Detection of Nuclear radiation – The Geiger Muller counter – Ionization chamber – Photographic detection methods – Neutron detection – Statistics of counting.

**UNIT 5** **(9 Hrs)**

**Air Pollution Sampling and Measurements**

Introduction – Units of pollution measurements – Air pollution standards – General air sampling – Train gas sampling techniques – Particulate sampling techniques – Sulpher dioxide measurements – Combustion products measurements – opacity measurements – odor measurements.

**Books for Study:**

Unit 1, 2, 4 to 5: Experimental methods for Experiments by Jack P Holman

Unit 3: Instrumentation Devices and Systems –C S Rangan, G R Sharma, V S V Mani TMH.

## SEMESTER – V
## CORE PAPER VI -MATHEMATICAL PHYSICS

**No. of credit hours : 5 per week**

**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** **(15 Hrs)**

**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** **(15 Hrs)**

**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** **(15 Hrs)**

**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** **(15 Hrs)**

**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** **(15 Hrs)**

**Vector Calculus**

$\nabla$ 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


## SEMESTER – V
## CORE PAPER VII -APPLIED ELECTRONICS

**No. of credit hours : 5 hours per week**

**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 (15 hrs)**

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 (15 hrs)**

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 (15 hrs)**

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 (15 hrs)**

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 (15 hrs)**

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.

**SEMESTER – V**

CORE PAPER VIII -SOLID STATE PHYSICS

**No. of credit hours : 4 hours per week**

**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 (12 hrs)**

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** **(12 hrs)**

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** **(12 hrs)**

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** **(12 hrs)**

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** **(12 hrs)**

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

## SEMESTER – V

AOS PAPER I -PRINCIPLES OF DIGITAL ELECTRONICS

**No. of credit hours : 3 hours per week**

**Subject Description**

This paper presents basic principles of digital electronics. This paper gives deep knowledge to the students regarding number system, arithmetic building blocks, memories and data processing circuits.

**Goal** To enable the students to learn the basic principles, theory and concepts of number system memories and data processing circuits counters

**Objectives**

To give description for the students in order to

- Learn the logic circuits
- Acquire basic knowledge of binary addition
- Understand the action and application of counters
- Get a deep knowledge of various memories used in computer circuits

**UNIT 1 - Logic Circuits (9 hrs)**

Boolean Algebra – NOT operation – OR operation – AND operation – Boolean equations with Logic circuits – Boolean law & Theorems – Basic laws – OR, AND Double Inversion and Demorgan's theorems – Duality theorems – Sum of Product method – Truth table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh simplification – Product of Sums method.

**UNIT 2 - Data Processing Circuits (9 hrs)**

Multiplexer – Demultiplexer – 1 to 16 decoders – BCD to Decimal decoders - Seven segment decoder – Encoders- Parity generator – checkers – Read Only Memory – Programmable array logic.

**Number systems and codes:**

Binary to Decimal conversion – Decimal to Binary conversion – Octal numbers – Hexa decimal numbers – The ASCII code – The Excess 3 code – The Gray code.

**UNIT 3 - Arithmetic Circuits (9 hrs)**

Binary addition - Binary Subtraction – Unsigned Binary numbers - sign magnitude numbers – 2's complement representation – 2's complement Arithmetic – Arithmetic building blocks – The Adder – Subtractor.

**Flip – Flops:**

RS flip flop – Clocked RS flip flop – D flip flop – Edge triggered D flip flop – JK flip flop – JK Master Slave flip flop – Schmitt trigger.

**UNIT 4 - Shift Register and Counters (9 hrs)**

Types – Serial In Serial Out – Serial In Parallel Out – Parallel In Serial Out – Parallel In Parallel Out – Ring counter – Asynchronous counter – Decoding gates – Synchronous counter – Mod 3 counter – Mod 5 counter – shift counter.

**UNIT 5 - Semiconductor Memories (9 hrs)**

Basic – Memory addressing – ROM's PROM's and EPROM's – RAM's – DRAM's – Dynamic RAM's.

**D/A and A/D Conversion:**

Variable – Resistor Network – Binary ladder – D/A converter – A/D converter – Simultaneous conversion – Counter method – continuous A/D conversion

**Books for Study:**

1. Digital Principles and Applications – Albert Paul Malvino & Donald P Leach (Fourth Edition, TMH)

**Books for Reference:**

Integrated Electronics – Millmann & Halkeias

**SEMESTER – V**
**AOS PAPER II**
**PRINCIPLES OF PROGRAMMING CONCEPTS AND C PROGRAMMING**

**No. of credit hours : 4 hours per week**
**Subject Description** This subject deals with the programming concepts of C language
**Goal** To learn about C programming with various features

**Objectives**

On successful completion of this subject the student should have.

- Writing programming ability on scientific and mathematical problems
- It is very useful to the students in many ways like their higher studies and research etc., because of its versatility.

**UNIT I (12 hrs)**

Introduction – character sets – constants – keywords – and identifiers – variables – variables – data types – declaration of variables – assigning values to variables – defining symbolic constants.

**UNIT II (12 hrs)**

Arithmetic operators – relational operators – logical operators – assignment operators – increment and decrement operators – conditional operators – special operators – arithmetic expression – evaluation of expression. – precedence of arithmetic operators – some computer problems – type conversion in expression – operator precedence and associativity – mathematical functions.

**UNIT III (12 hrs)**

Reading and writing character – formatted input and output – decision making : IF statement : Simple IF – IF ELSE – Nesting of IF.. ELSE – ELSE. IF Ladder – Switch Statement – operator – go to statement – while .. do while – For loop – Jumps in loops – simple programs.

**UNIT IV (12 hrs)**

Arrays : Introduction – One dimensional array – declaration of array – Initiating on two and multidimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings on the screen – Arithmetic operations on characters – simple programs.

**UNIT V (12 hrs)**

Need for user defined functions – A multifunction program – RETURN values and their types – functions calls – category of functions – no arguments and no return values – simple programs.

**Text Book**

1. "Programming in ANSI C" by E. Balagurusamy, 3rd Edition

**Reference Book**

1. Programming in C by Ashok N. Kamthane First Indian Print 2004, Pearson.

## SEMESTER – V
## DIPLOMA PAPER III -INSTRUMENTATION III

**No. of Credit Hours : 3 Hours per week**

**Subject Description**

To study the instrument with its principle and observe the method their functioning

**Goal and objectives**

- ✓ To provide a good foundation in measurements
- ✓ To provide a knowledge of the behaviour of instruments
- ✓ To inspire interest for the knowledge of concepts regarding measurements

**UNIT 1** **(9 hrs)**

**Data Acquisition and Conversion**

Introduction – Signal conditioning of the inputs – Single channel data acquisition systems – Multi channel data acquisition system – Data conversion – Digital of Analog converter – Analog to Digital converter – Multiplexer and Sampling hold circuits.

**UNIT 2** **(9 hrs)**

**Input – Output Devices and Displays**

Introduction – Analog display and recorder – Graphic recorder – Optical oscillograph – self balancing potentiometer – X-Y recorder – Magnetic recorder – Digital input – output devices – Punched card-paper type – output equipments – Line printer – Digital tape recording – Disk files and floppy disk.

**UNIT 3** **(9 hrs)**

**Basic meter movements**

Permanent magnetic moving coil movements – Practical PMMC movements – Taut band instrument – Electro dynamometer – Moving ion type instrument – Concentric vane repulsion type (Moving ion type) – Display devices: LED – LCD – Gas discharge Plasma displays – Sequential display using LED's – Line printer – Drum printer – dot matrix printer.

**UNIT 4** **(9 hrs)**

**Digital Instruments**

Introduction – Digital Multi meter – Digital panel meters – Digital frequency meters – Digital measurement of time – Universal counter – Digital measurement of frequency – Digital tacho meter – Automation in digital instruments.

**UNIT 5** **(9 hrs)**

**Oscilloscope**

Introduction – Basic principles – CRT features – Basic principles of signal displays – Block diagram of oscilloscope – Simple CRO – Vertical amplifier – Horizontal deflecting system – Delay line in triggered sweep – CRT connection – Dual beam CRO – Dual beam oscilloscope – Storage oscilloscope measurement of frequency, capacitance, inductance and Voltage.

**Book for Study:**

Unit 1& 2: Instrumentation Devices and Systems –

C S Rangan, G R Sharma, V S V Mani TMH

Unit 3, 4 & 5: Electronic Instrumentation by H S Kalsi TMH.

**SEMESTER – VI**

CORE PAPER IX - QUANTUM MECHANICS AND RELATIVITY

**No. of credit hours : 6 hours per week**

**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 (18 hrs)**

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 (18 hrs)**

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 (18 hrs)**

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 (18 hrs)**

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 (18 hrs)**

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

SEMESTER – VI

CORE PAPER X -NUCLEAR PHYSICS

**No. of credit hours : 6 hours per week**

**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 - Introduction to the Nucleus (18 hrs)**

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 2 - Detector and Particle Accelerators (18 hrs)**

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.

**UNIT 3 – Radioactivity (18 hrs)**

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 4 - Nuclear Fission and Fusion Reactions (18 hrs)**

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.

**UNIT 5 - Cosmic rays and Elementary particles (18 hrs)**

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

**SEMESTER – VI**

AOS PAPER III -MICROPROCESSORS

**No. of Credit Hours : 4 hours per week**

**Subject Description :**This subject deals with the functions and principles of Micro Processors

**Goal:** To learn about function of micro processors and operate them by learning with different features.

**Objectives**

On successful completion of this subject the student should have

- The knowledge of basic computer
- To operate the devices with basic idea

**UNIT 1 - Microprocessor and Data Representation (12 hrs)**

Basic concept – what is Microprocessor, 4, 8, 16, 32 – Organization of Microprocessor – Microprocessor Programming – Instruction – Machine and Mnemonic codes – Machine and Assembly Language Programming – High level Language programming – Timing diagram conventions.

Representation of Integers – Positive integers – Maximum Integer – Negative Number representation – Minimum Integer - Representation of Real numbers – Conversion of Real numbers – floating point notation – Representation of Floating numbers – Binary Arithmetic, Addition and Subtraction of Binary Integers – Over flow and Under flow addition of floating numbers – Character representation.

**UNIT 2 Programming a Microprocessor (12 hrs)**

Organization of 8085 – Data and Address buses addressing – The I/O devices – Register in 8085 – Instruction types – Classification of Instruction – Addressing modes – Programming the 8085 – The Programming process – machine language programming – Assembler Programming – The instruction format, Assembler directives, Constant in assembly programming – Language for writing algorithms – The Stack – Subroutines.

**UNIT 3 Semi Conductor Memories (12 hrs)**

Introduction – Registers – Primary memory – Mass storage, cache – off line backup – memory chips – static and dynamic RAMs, ROMs and their versions characteristics of memories : Memory chip capacity and organization – memory size – combining the chips together with example electrical signals. Static RAM : Organisation of 6264 – Read and write cycle of 6264 – dynamic RAMS : Organisation of 51100 x – Read and write cycle of 51100 x RAS only fresh hidden fresh – Burst and distributed i.e., fresh – pseudo static ram and automatic refresh – page mode operation of dynamic RAM – Nibble mode operation – Static column mode – Prove requirements of DRAMS MTBF computation.

**UNIT 4 Microprocessor Timings (12 hrs)**

Timing and control unit – Basic concept – The Fetch operation – The executive cycle – Machine cycle and state – Instruction and Data flow – Timing of Intel 8085, 8085 buses – Opcode fetch cycle – Memory and I/O read and write cycle – Interrupt timings – The Halt and Hold states – Register organization – General purpose register – The Stack.

**UNIT 5 Interfacing Memory and I/O Devices (12 hrs)**

Introduction – Address space partitioning – The Address map – Address decoding – Using the 1 of N decoder – Memory Interfacing – Bus connection and 2 line control – Access time computations – Data transfer schemes – Programmed data transfer – Synchronous transfer – Asynchronous transfer – Interrupt driven data transfer – Multiple Interrupt enabling – disabling and Masking Interrupt – Direct Memory access data transfer – Multiple DMA devices – DMA transfer in an 8085 based system – Serial data transfer.

**Books for Study:**

1. Introduction to Microprocessors by Aditya P Mathur (3rd Edition TMH)

**Book for Reference:**

1. Microprocessors by Goenkar.
2. Microprocessors by K Ramachandran.

## SEMESTER – VI
## AOS PAPER VI -OBJECT ORIENTED PROGRAMMING WITH C++

**No of credit hours : 5 hours per week**

**Subject Description :**This subject deals with the programming concepts of object oriented programming using C++

**Goal:** To learn about object oriented programming concepts with different features

**Objectives**

On successful completion of this subject the student should have

- Writing program ability on oops concepts like encapsulation, data abstraction, Inheritance, polymorphism and overloading etc.
- To implement various scientific and mathematical problems with minimum no. of lines.

**UNIT I (15 hrs)**

Software evolution – Procedure Oriented programming object oriented programming (oop) – Basic concepts benefits of OOP – Obejct oriented languages – Application of OOP – A simple C++ program – Structure of C++ program- Tokens – Key words- Identifiers and constants Basic data types – User defined Data Types – Derived data types – symbolic constants – Type compatibility – Declaration of variables – Dynamical Initialization of variables – Reference variables – Operators in C++ - Scope resolution operators.

**UNIT II (15 hrs)**

The main function – Function prototyping – call be reference – Inline functions – Default arguments – Function overloading – Math library functions - classes and objects.

**UNIT III (15 hrs)**

Constructors and destructors – operator over loading and type conversions

**UNIT IV (15 hrs)**

Inheritance : Extending classes – Pointers- Polymorphism – pointers to objects – this pointer pointers to derived classes.

**UNIT V (15 hrs)**

Virtual functions – pure virtual functions – Managing console I / o operators.

**Text Book**

1. "Object Oriented Programming with C++" by E. Balagurusamy, Second edition.
2. Programming with C++, John R. Hubbard, II Edition 2002, TMH Publications

## CORE PRACTICAL – III– ELECTRONICS PRACTICAL
## (EXAMINATION AT THE END OF SIXTH SEMESTER)
## 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 SIXTH SEMESTER)
## 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

**AOS PRACTICAL - (EXAMINATION AT THE END OF SIXTH SEMESTER)**

**PRACTICAL – I C AND C++ PRACTICAL ANY TWELVE (12) EXPERIMENTS ONLY**

**Programming in C**

1. Find the number of Days elapsed between two dates.
2. Convert Integer in the range 1 to 100 in words.
3. Write a program that uses functions to compare two strings input by user. The Program should state whether the first string is less than, equal or greater than the second Strings.
4. Write a Program to compare two files printing the Character position where they equal and where they are differ.
5. Write a Program for Matrix addition
6. Write a Program for Matrix Multiplication.
7. Write a Program for Addition of Two times
8. Write a Program for find the Inverse of given Matrix
9. Write a Program for display the Multiplication table.

**Programming in C++**

1. To read any two number through the key board and to perform simple Arithmetic Operation ( Use Do while loop)
2. To display the name of the day in a week, depending upon the number entered through the keyboard using Switch – case statement.
3. To read the elements of the given two matrix of m X n and to perform the Matrix addition
4. Write a Program for Matrix Multiplication table.
5. Write a Program to find the Inverse of Given m X n Matrix
6. Write a Program to find the Modulus of the Given Number
7. Write a Program to compare two files printing the character position where they are equal and where they are differ.

**SEMESTER – VI - DIPLOMA PAPER IV**

**INSTRUMENTATION PRACTICAL (ANY TWELVE)**

1. Construction and Service of Power supply - 2, 4, 6 Volts
2. Regulated power supply construction and service - 5V& 12V
3. Dual power supply construction and service - (-12)-0- (+12)
3. Regulated power supply service - 5V& 12V
4. Dual power supply service - (-12)-0- (+12)
5. Servicing - Microscope
1. Servicing Telescope
6. Servicing - Spectrometer
7. Servicing -Galvanometer,
8. Servicing - Voltmeter
9. Servicing - Ammeter.
10. Servicing --UPS
11. Servicing ---Stop clock and Stop watch
12. Servicing ---Physical Balance
13. Servicing.—Mixie
14. Servicing.—Resistance box and Capacitance box
15. Servicing --- Signal Generators
16. Fixing and servicing a B.G.
17. Cutting, drilling, polishing and trimming.
18. Servicing.—Iron Box

**Model Question Papers**

**HEAT AND THERMODYNAMICS**

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The unit of specific heat capacity
   a) J $Kg^{-1}$ $S^{-1}$ b) J $Kg^{-1}$ $K^{-1}$ c) J $(mol)^{-1}$ $K^{-1}$ d) None of the above
2. According to Mayer's relation
   a) the difference of two spherical heat capacity must be constant
   b) The ratio of two spherical heat capacity must be constant
   c) The product of two spherical heat capacity must be constant
   d) None of the above
3. The heat transfer from higher temperature places to lower temperature places is called _____
   a) Radiation b) Conductor c) Convection d) Flow of heat
4. The equation of Stefan's laws
   a) $E = \sigma / T^4$ b) $E = \sigma T^4$ c) $E = \sigma / T^2$ d) $E=mc^2$
5. The ratio of two spherical heat capacity for mono atomic molecules
   a) 1.33 b) 1.44 c) 1.66 d) none of the above
6. The formula of mean free path become
   a) $\square = \frac{1}{\sqrt{2}\sigma^2 n}$ b) $\square = \frac{8\pi^2}{\sqrt{2}\sigma^2 n}$ c) $\square = \frac{1}{\sqrt{2}\,\eta\ell^2}$ d) None of the above
7. The slope of an adiabatic is _____ the slope of the isothermal
   a) $\gamma$ times less than b) $\gamma$ times greater than
   b) $\gamma$ times d) 100 times
8. The relation between volume and temperature of adiabatic process becomes
   a) $\frac{p^\gamma}{T^{\gamma-1}} =$ constant b) $\frac{V^{\gamma-1}}{T^\gamma} =$ constant
   c) $PV^\gamma =$ constant d) None of the above
9. The change of entropy in reversible cycle must be _____
   a) greater than one b) less than one
   c) equal to one d) Equal to zero
10. The equation efficiency becomes
    a) $\eta = 1 - \frac{Q_2}{Q_1}$ b) $\eta = \frac{Q_2}{Q_1} - R^2$ c) $\eta = 0$ d) None of the above

**SECTION – B (5 X 6 = 30)**

**Answer all the questions**

11. a) Define $C_p$ and $C_o$ why $C_p > C_o$ ?

    [or]

    b) Derive an expression for Mayer's relation.
12. a) Explain co-efficient of thermal conductivity with suitable examples.

    [or]

    b) Explain a) Caps rate b) Green House effect.

13. a) Define Mean free path. Find an expression for mean free path.

[or]

b) Explain equipartion of energy with suitable examples.

14. a) Derive an expression for work done during an adiabatic expansion of gas.

[or]

b) State and explain I law of thermodynamics.

15. a) What is entropy? What happens to entropy during irreversible process – Explain.

[or]

b) Explain temperature energy diagram.

**SECTION – C (5 X 12 = 60)**

**ANSWER ALL THE QUESTIONS**

16. a) Describe Joly's method to find specific heat capacity at constant volume [or]

b) Describe callender and Barne's method to find specific heat capacity at constant pressure.

17. a) Describe Lee's disc method to determine thermal conductivity of bad conductor.

[or]

b) Discuss an experimental determination of Stefan's constant.

18. a) Explain Maxwell's law of distribution of molecular velocities.

[or]

b) Establish diffusion, viscosity and thermal conduction using transport phenomena.

19. a) Describe element and Desorme's method to find $\gamma$. Give the draw back of that method.

[or]

b) Explain the equation of a adiabatic curve.

20. a) Calculate the change in entropy of a system containing 1 Kg of ice at $0^oC$ which melts at the same temperature L of ice = 79.6 K cal / Kgm

[or]

b) Explain Joul – Kelvin effect from Maxwell's thermo dynamical relation

## MECHANICS, PROPERTIES OF MATTER AND ACOUSTICS

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

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The Rate of change of momentum is equal to

a) Acceleration b) force c) Work done d) Power

2. The unit of power is

a) Newton b) Joules c) Watt d) Meter – $Sec^2$

3. The formula of moment of inertia is

a) $I = M / R^3$ b) $I = MR^2$ c) $I = MR^3$ d) None of the above

4. The Torque is equal to the _____ product of _____ and _____
   a) Cross, force, displacement
   b) Cross, force, velocity
   c) Scalar, force, displacement
   d) Scalar, force, velocity
5. The value of gravitational constant is
   a) 6.47 x 10-11 $Nm^2 Kg^{-2}$ b) 5.88 x 10-11 $NM^2 Kg^{-2}$
   c) 6.47 x 1011 $Nm^2 Kg^{-2}$ d) 6.023 x $10^{23}$ $mol^{-1}$
6. According to Hook's law, elastic constant is equal to
   a) Stress x Strain b) Strain / Stress
   c) Strain x Stress d) Stress / Strain
7. The SI unit young's modulus is
   a) Newton – $meter^2$ b) Newton – $Meter^{-2}$
   c) Newton – kilogram d) Newton – $sec^{-2}$
8. The position law's formula becomes
   a) $V = \frac{\pi Pa}{8sl}$ b) $\frac{\pi Pa^4}{8\eta\ell}$
   b) $V = \eta Pa^4 / 2\ell$ d) None of the above
9. In stream line flow, the total energy per unit mass of the liquid at any point is,
   a) $\frac{v^2}{2} + gh$ b) $\frac{v^2}{2} + \frac{gh}{2} + p$ c) $\frac{v^2}{2} + gh + \frac{P}{\ell}$ d) $2v^2 + \frac{gh}{2} + p$
10. In Meldi's string experiment, the transverse mode of vibration becomes
    a) $\gamma = \frac{1}{2\pi}\sqrt{\frac{\ell}{T}}$ b) $\gamma = \frac{1}{\pi}\sqrt{\frac{\ell}{T}}$ c) $\gamma = 2\pi\sqrt{\frac{\ell}{T}}$ d) None of the above

**SECTION B ( 5 X 6 = 30)**

**Answer all the questions**

11. a) Calculate the loss of energy during direct impact.

    [or]

    b) State and explain angle of friction.
12. a) State the explain parallel and perpendicular axis theorem.

    [or]

    b) Find the relation between torque and angular momentum.
13. a) State and explain Newton's law of gravitation.

    [or]

    b) How 'g' various with depth?
14. a) Explain Rotation viscometer.

    [or]

    b)Write a short notes on venturemeter and filter pump.
15. a) Explain simple harmonic motion.

    [or]

    b) State the properties of ultrasonics.

**SECTION C ( 5 x 12 = 60)**

**Answer all the questions**

16. a) Describe the oblique impact. Find the final velocity and loss of kinetic energy in the above case.

    [or]

b) Derive an expression for equilibrium for a body on a rolling down an inclined plane to horizontal.

17. a) Explain moment of inertia. Determine the moment of inertia of solid sphere about all axis.

[or]

b) Explain a) Kinetic energy of rotation and
b) Conservation of angular momentum

18. a) Describe an experiment to determine 'G' by Boy's method with necessary theory.

[or]

b) Describe an experiment to find the young's modulus by uniform bending.

19. a) State and prove Bernoulli's theorem.

[or]

b) Describe the Rankine's method to determine viscosity of gas.

20. a) Describe how ultrasonic waves are produced. Explain the application of ultrasonics.

[or]

b) Describe Mede's experiment to determine frequency of fork using traverse and longitudinal modes.

## ELECTRICITY AND MAGNETISM

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Gauss theorem relates
   a. Electrical intensity with charged sphere
   b. Electrical induction with charge
   c. Dielectric constant with electrical intensity
   d. charge and surface density
2. Capacity of a parallel plate condenser
   a. Depends on the area of the plates
   b. Decrease when we decrease the distance of two plates
   c. Increases and then decreases with respect to the area of plate
   d. Decreases when the distance between two plates were increased
3. Intensity of magnetization is more for iron than that of steel
   a. Retentivity is less for steel b. susceptibility is less for steel
   c. Coercivity iron is large d. Susceptibility is less for iron
4. Reductance of the magnetic circuit can be decreased by
   a. Increasing the area of cross section of the ring
   b. Decreasing the mean circumference of length
   c. increasing the turns of the winding
   d. Making the specific resistance to be zero
5. The method of producing current without using cell (or) battery was given by
   a. Thomson b. Seebeck c. Peltier d. Caswell's
6. A graph connecting thermo-electric power with temperature will be
   a. Straight line b. Exponential curve c. Parabola d. ellipse

7. In ballistic galvanometer the work done in twisting the suspension fiber by an angle is equal to

a. $\frac{C\theta}{2}$ b. $\frac{C}{nab}$ c. $IW^2 / 2$ d. $\frac{C+\theta}{2\pi}$

8. Eddy current loses can be completely eliminated in

a. Induction coil dynamos b. Transformer lines
c. Ballistic galvanometer d. None of the above

9. The force experience by a charge q is equal to

a. E b. Eq c. E / q d. q / E

10. Cyclotron frequency is independent of

a. Mass of the particle b. Charge of the particle
c. the applied magnetic field d velocity of the particle

**SECTION B (5 x 6 = 30)**
**(Answer all the questions)**

11. a. State and prove Gauss theorem.

[or]

b. Define electric potential and electric intensity. obtain the relation between them.

12. a. Explain the terms: Hysterisis, Retentivity and coercive forces

[or]

b. Discuss the importance of hysterisis curve

13. a. State and explain Kirchoff's Laws of electricity.

[or]

b. explain the principle of Seebeck and peltier effect.

14. a. Explain faraday's law of electromagnetic induction.

[or]

b. State and prove Laplace law.

15. a. Prove that the path of charged particle in a magnetic field in general the B helix

[or]

b. Derive an expression for the self inductance of co-axial cylinder.

**SECTION C (5 X 12 = 60)**
**(Answer all the questions)**

16. 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.

[or]

b. What is condenser? Obtain an expression for the capacity of spherical conductor and parallel plate condenser?

17. a. Explain what is meant by magnetic circuit. What is its significance?

[or]

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.

18. a. Describe the principle and the theory of Thomson effect. Deduce an expression for Thomson co-efficient

[or]

b. What is thermoelectric power? What are the applications of thermodynamics to a thermocouple.

19. a. Give the principle and theory of moving B.G. and obtain the damping correction

[or]

b. Define self – inductance and give its unit. How can you measure the self – inductance experimentally.

20. a. Discuss the motion of a charged particle in crossed electric and magnetic field.

[or]

b. Discuss the theory and construction of a Grassot's flux meter. How is it used in actual practice.

## OPTICS

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Spherical observation for convex lens is
   a) positive b) equal to zero c) negative d) can be positive or negative
2. In a direct vision spectroscope
   a) there is no resultant deviation
   b) There is resultant deviation and dispersion
   c) there is no resultant dispersion
   d) no image is obtained
3. The radius of the $m^{th}$ dark in the Newton's rings formed under reflected light is
   a) $r_m = \sqrt{mR\lambda}$ b) $r_m = 4\sqrt{mR\lambda}$ c) $r_m = 2\sqrt{mR\lambda}$ d) $r_m = \sqrt{2mR\lambda}$
4. Two sources of light are said to be coherent of the waves introduced by them have the same
   a) wavelength b) wavelength and constant phase difference
   c) amplitude d) constant phase amplitude and the same wavelength
5. Diffraction fringes
   a) are of the same width b) are perfectly dark
   c) are not of the same width c) have the uniform maximum intensity
6. Using a grating, the diffraction angle for violet end of the spectrum is
   a) less than that of red b) greater than that of red
   c) equal to that of red d) less than that of ultraviolet
7. When natural light is incident on a linear polarizer, its vibration are completely blacked when they are
   a) parallel to the transmission axis
   b) perpendicular to the transmission axis
   c) at $45^o$ to the transmission axis
   d) at $60^o$ to the transmission axis
8. Using a light source of wavelength $\lambda$, the specific rotation of a given solution is
   a) directly proportional to $\lambda$ b) inversely proportional to $\lambda$
   c) independent of $\lambda$ d) independent of concentration
9. The population ratio is governed by the Boltzmam distribution, when the material is in thermal equilibrium condition as

a) $\frac{N_2}{N_1} = e^{-(E_1+E_2)/KT}$ b) $\frac{N_2}{N_1} = e^{-(E_1-E_2)\ KT}$

c) $\frac{N_2}{N_1} = e^{-(E_1-E_2)\ kT}$ d) $\frac{N_2}{N_1} = e^{-(E_1-E_2)\ /\ kT}$

10. In a $H_e - N_e$ laser, transmission from E6 to E3 level generation a beam of wavelength
a) 6328 $A^o$ b) 3390 $A^o$ c) 6328 μm d) 1150 μm

**SECTION – B ( 5 x 6 = 30 marks)**
**(Answer all the questions)**

11. a) Explain the defect "coma" in lenses. How would you minimize it.

[OR]

b) Describe chromatic observation in a lens surface. Explain how the work of least confusion depends on diameter of the lens aperture

12. a) Explain the phenomenon of interference in thin films due to reflected light.

[OR]

b) Describe any two applications of Michaelson's interferometer

13. a) What are zone plates? Compare and contrast a zone plate with a convex lens

[OR]

b) Arrive at an expression for the revolving power of a grating. What is dispersive power of a grating. How does it differ from resolving power?

14. a) Give an account of the production and detection of elliptically polarized light

[OR]

b) Explain detail – optical activity with necessary diagram.

15. a) What is population inversion? Explain its importance in the laser action between atomic levels.

[OR]

b) Describe a carbon dioxide laser, its action and uses.

**SECTION – C (5 X 12 = 60)**
**(Answer all the questions)**

16. a) Define dispersion and deviation in Prison. Describe the combination of two prisms to produce

(i) dispersion without deviation
(ii) deviation without dispersion

[OR]

b) Explain Ramsdens and huygens eye piece compare them.

17. a) What do you understand by achromation of lenses. Discuss the condition for achromatism of two lenses separated by a finite distance.

[OR]

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

18. a) Describe the Fraunhofer diffraction at a single slit? What is a diffraction grating? Describe the method of determining the wavelength of light using a grating.

[OR]

b) Distinguish between interference and diffraction. Discuss Rectilinear propagation of light.

19. a) Explain specific rotation. Describe in detail the construction and working of a Laurent half shade polarimeter.

[OR]

b) Explain the phenomenon of double refraction in calcite crystal Describe Heygen's theory of double refraction

20. a) Give an account of threshold condition for laser. Describe in detail stimulated Raman scattering.

[OR]

b) In a powerful $CO_2$ laser the energy difference between the two laser levels is 0.117eV. Determine the frequency and wavelength of the radiation.

## DIPLOMA PAPER – INSTRUMENTATION I

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

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The accuracy of a measurement is purely
   a) an absolute term b) a relative term c) a variable term d) a constant
2. In all calibration procedures, it is advisable to take readings both in the
   a) Ascending order b) descending order c) Both of the above d) None 3. The static sensitivity in an instrumentation system is
   a) $a_o - b_o$ b) $a_o + b_o$ c) $a_o / b_o$ d) $b_o / a_o$
4. Taking the speed as equal to the speed of sound, the dead time for a 300m length tube is of the order of
   a) one second b) Ten seconds c) One minute d) Ten minutes
5. The elastic deformation formed is bourder – tube pressure gage is proportional to
   a) the pressure b) applied force
   c) the surface tension d) the momentum
6. For dry gases the Mcheod gage is applicable from
   a) $10^{-2}$ to $10^{2}$ μm b) $10^{-3}$ to 10 μm c) $10^{-3}$ to $10^{3}$ μm d) $10^{-1}$ to $10^{-3}$ μm
7. The drag co-efficient of a liquid is dependent on the
   a) Reynolds number b) Surface tension c) nozzle of tube d) Place
8. The ratio of the actual flow to the ideal flow rate is
   a) Reynolds number b) discharge co-efficient
   c) flow co-efficient d) specific co-efficient
9. Freezing point of mercury is
   a) $37.8^{o}$ C b) $-37.8^{o}$ C c) $38.78^{o}$ F d) -100 K
10. The thermistor is a _____ device.
    a) Conductor b) Insulator
    c) Semiconductor d) Any one of the above

**SECTION – B (5 x 6 = 30)**

**(Answer all the Questions)**

11. a) What are the measurement problem rules in problem analysis.

[or]

b) What is transducer? Explain briefly piezoelectric transducer.

12. a) Write about zero-order system.

[or]

b) Explain briefly specification and testing of dynamic response.

13. a) Write about dead weight tester

[or]

b) Write about Knudsen gauge

14. a) Write about shadow graph. Where will use this method.

[or]

b) Construction and explain the magnetic flow meters.

15. a) Write about ideal gas thermometer.

[or]

b) What is thermister? Explain with diagram

**SECTION – C ( 5 x 12 = 60)**

**Answer all the questions**

16. a) Write any five basic characteristics of measuring devices

[or]

b) How many types of transducer are available explain briefly hall effect and ionization transducers with diagrams

17. a) Explain second order system and dead time element.

[or]

b) What are the methods used in the generalized measurement? Explain.

18. a) Explain the principle of mechanical pressure- measurement devices.

[or]

b) Describe Pirani gage and ionization gage. Compare their merits and demerits

19. a) Explain briefly U type monometer and well type monometer

[or]

b) Explain hot wire and hot film anemometer

20. a) Give the theory about temperature measurement by mechanical effects.

[or]

b) Explain the thermoelectric effect. Give the principle of quartz crystal thermometer.

## ATOMIC PHYSICS AND SPECTROSCOPY

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Isotopes of a given element have the same
   a. Atomic weight
   b. Number of elementary particles in the nucleus
   c. number of proton in the nucleus
   d. number of neutrons in the nucleas
2. When positive rays are deflected by electric field
   a. the velocity of the particles remains constant
   b. the momentum of the particles remains constant
   c. the kinetic energy increases
   d. the kinetic energy remains constant
3. Ionisation potential of hydrogen is
   a) 10.2 eV b) 1.51 eV c) 12.09 eV d) 13.6 eV
4. Sommerfield's relativistic atom model introduced the idea of 11

a. the motion of electron in elliptical orbits
b. the variation of mass of the electron with velocity if it is considerable
c. Both of the above
d. None of the above

5. A spectral line of wavelength $\lambda$ is applied with a magnetic field's. The zeeman shift $\delta\pi$ is calculated by

a) $\pm\frac{Be\lambda}{4\pi mc^2}$ b) $\pm\frac{Be\lambda^2}{4\pi mc}$ c) $\pm\frac{Bc\lambda^2}{4\pi me}$ d) $\pm\frac{Bc\lambda}{4\pi me^2}$

6. Under special notation a state of an atom with L=1, S=1/2 and J = 3/2 would be written as,

a) $P_{3/2}$ b) $^2P_{3/2}$ c) $^1D_{3/2}$ d) $^2D_{3/2}$

7. Photoelectric cell converts
a) electric energy into light energy
b) chemical energy into electrical energy
c) light energy into electric energy
d) magnetic energy into electrical energy

8. For a photosensitive material the threshold wavelength is given by,

a) $\lambda_o = \frac{ch}{W_o}$ b) $\lambda_o = \frac{W_o}{ch}$ c) $\lambda_o = \frac{c\gamma_o}{W_o}$ d) $\lambda_o = \frac{W_o}{c\gamma_o}$

9. Wavelength of visible light is more than that of x- rays if the velocity of x rays in vaccum is,
a) less than velocity of light
b) greater than the velocity of light
c) same as the velocity of light
d) sometimes less and some times more than the velocity of light

10. The continuous x rays spectrum produced by an X –ray machine at constant voltage has
a) maximum wavelength b) Minimum wavelength
c) minimum frequency d) single wavelength

**SECTION B ( 5 x 6 = 30)**

**(Answer all the questions)**

11. a) What are positive rays? State their properties define mass defect and packing fraction.

[OR]

b) Describe the construction and working of Dempster's mass spectrograph. How is it useful to determine the masses of the isotopes?

12. a) Discuss the methods of excitation of an atom.

[OR]

b) Explain the quantum number in vector atom model

13. a) Give Lorentz classical theory of normal Zeeman effect.

[OR]

b) Explain – Paschen – Back Effect.

14. a) Explain photoelectric effect. Give an account of Einsteins explanation of photoelectric effect on the basis of quantum theory.

[OR]

b) Describe different types of photoelectric cells and explain their action.

15. a) State the properties of X –rays.

[OR]

b) Describe powder crystal method for studying crystal structure.

**SECTION – C ( 5 X 12 = 60)**

**(Answer all the questions)**

16. a) Describe Thomson's parabola method for positive ray analysis. Discuss the limitations

[OR]

b) Describe the detail Aston's man spectrograph and its use in detection of isotopes

17. a) Give an account of Bohr's atom model

[OR]

b) State Paul's exclusion principle. Describe the classification of elements based on this theory.

18. a) Explain in detail anomalous Zeeman effect, with necessary theory.

[OR]

b) What do you mean by Stark effect. Explain the relevant experiment. Discuss its results

19. a) Give an account of Millikan;s experimental verification of Einstein's photo electric equation.

[OR]

b) Describe Richard and comptem experiment. Discuss the observation.
Calculate the work function in electron volts for sodium metal, given the photoelectric threshold wavelength at 6000 $A^o$.

20. a) X – rays wavelengths 0.1nm are scattered at an angle that the recoil electron has the maximum kinetic energy. Calculate the wavelength of the scattered ray and energy of the recoil electron.

[OR]

b) In an experiment with a mass spectrometer a singly charged positive ion (q = 1.620 x $10^{-19}$ c) is accelerated through a potential difference of 1000v. It then enters a transverse uniform magnetic field of 0.100 wb /$m^2$ and moves in a circular orbit of radius 0.223m. Obtain the values for (a) the speed of the ion (b) mass in kg and in amu and (c) the mass number of the ion.

**DIPLOMA PAPER – INSTRUMENTATION II**

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The total thermal radiation emitted by a block body is given by

a) $\varepsilon = E / Eb$ b) $Eb = \sigma T^4$ c) $Eb = 1$ d) None

2. The actual device that is usually used for the experiment is called the

a) Junkers calorimeter b) Franks calorimeter

b) Both A & B d) None

3. In Electrical resistance strain gauge, the change in resistance with strain is,

a) $\in = F \frac{\nabla R}{R}$ b) $\in = \frac{1}{F} \frac{R}{\nabla R}$ c) $\in = \frac{1}{F} \frac{\nabla R}{R}$ d) $\in = 0$

4. The deflection of the cantilever beam is related to the applied force by

a) $F = \frac{3EI}{L^3} y$ b) $F = \frac{3EI}{L^3} \frac{1}{y}$ c) $F = \frac{3EI}{L} y$ d) None

5. In random vibrations, the vibrator amplitudes are irregular with respect to
   a) Velocity b) oscillation c) time d) All of the above
6. In banded strain gauge acceleration, the strain produced due to acceleration $\ddot{y}$ is given by
   a) $\frac{\varepsilon}{\ddot{y}} = \frac{m}{A}E$ b) $\frac{\varepsilon}{\ddot{y}} = 1$ c) $\frac{\varepsilon}{\ddot{y}} = m\ AE$ d) $\frac{\varepsilon}{\ddot{y}} = \frac{m}{AE}$
7. Ionization chamber are used for _____ measurements
   a) Energy level b) Mean level c) force level d) None
8. The probability that n atoms will decay is given by the poisson distribution as
   a) $p(n) = \frac{n^{-n} e^{n}}{n!}$ b) $p(n) = n^{-n} e^{n} n$ c) $p(n) = \frac{n^{n} e^{-n}}{n!}$ d) $P(n) = 1$
9. In Impingement collection devices, the air sample is first accelerated to
   a) High velocity b) High acceleration c) low velocity d) none
10. Potassium hydroxide is normally used as the regent to absorb
    a) $O_2$ b) $Co_2$ c) $So_2$ d) $No_2$

**SECTION – B (5 x 6 = 30)**

**Answer all the questions**

11. a) Explain transient response of thermal systems

    [or]

    b) Explain the thermal conductivity of liquids and gases.
12. a) What is stress and strain? Explain about strain measurement

    [or]

    b) Write about temperature compensation?
13. a) Write short note on solar radiation measurement.

    [or]

    b) What do you mean by Neutron detection?
14. a) Filtration techniques - Explain.

    [or]

    b) Write short notes on electro conductivity analysis to $So_2$
15. a) What are the reasons of the vibration measurement. Short note on shock.

    [or]

    b) Describe any one vibration sensing devices

**SECTION – C (5 x 12 = 60)**

**(Answer all Questions)**

16. a) Explain briefly the effect of heat transfer on temperature measurement

    [or]

    b) Explain the principle of Heat – Flux meters.
17. a) What is force? Explain with equation. How are the elastic elements used for force measurement.

    [or]

    b) Distinguish between stress and strain. What is Poisson's ratio. Explain the measurement of resistance strain –gage outputs.

18. a) Explain (1) Absolute displacement (2) Absolute velocity and 3) Absolute Acceleration.

[or]

b) How the vibration of large structures are measured using servo accelerometer

19. a) Explain the principles for the measurements of (i) Emissivity ii) Reflectivity iii) Transmissivity

[or]

b) Give the theory about Gm counter and Ionization chamber.

20. a) Distinguish between source and ambient air –pollution standards. What are the advantage of each?
What is the range of sizes of most atmospheric particulate matter.

[or]

b) How does
i) an Orsat apparatus.
ii) gas chromatograph work.

## MATHEMATICAL PHYSICS

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

**SECTION – A (10x1=10)**

**Answer All Questions**

Choose the Correct Answer

1. If L is Lagrangian, T is the total kinetic energy, V is potential energy then L is equal to
a) T + V b) T – V c) L / V d) V/ L

2. De' Alembert's principle is

a) $\sum_i (F_i - \dot{p}_i) . \delta r_i = 0$ b) $\sum_i (F_i - p_i)\ \delta r_i = 0$

c) $\sum_i (F_i - P_i) .\ r_i = 0$ d) $\sum_i (F_i - p_i)\ \ r_i = 0$

3. Hamillonian of a system represents
a) K.E. b) P.E. c) K.E – P.E. d) K.E+P.E

4. For conservative system the potential energy
a. depend on generalized
b. does not depend on generalized velocity
c. is zero
d. None of the above

5. $\beta(m,n)$ is
a) $\frac{\Gamma(m)\ \Gamma(n)}{\Gamma(mn)}$ b) $\frac{\Gamma(m)\ \Gamma(n)}{\Gamma(m+n)}$ c) $\frac{\Gamma(m+n}{\Gamma(mn)}$ d) None of the above

6. The value of $\Gamma(1/2)$ is equal to
a) $\pi$ b) $2\pi$ c) $\sqrt{\pi}$ d) $\pi^2$

7. The eigen values of a Hermilton matrix are
a) Negative b) Real c) Zero d) Fractional

8. If A is orthogonal then $|A|$ is
a) 0 b) -1 c) +1 d) $\pm 1$

9. curl curl curl crul F is

a) $\nabla F$ b) $\nabla^2 F$ c) $\nabla^3 F$ d) $\nabla^4 F$

10. By stokes theorem

a) $\oint F.dr = \iint (\nabla X\ F)\, ds$ b) $\iint_S \vec{F}.d\vec{s} = \iiint_V (\nabla X\ F)\hat{n}\ ds$

c) $\oint F.ds = \iint \vec{F}.d\vec{s}$ d) $\int \vec{F}.d\vec{r} = \iiint (\nabla X\ \vec{F})\ d\vec{s}$

**SECTION B (5 x 6 = 30)**

**(Answer all the questions)**

11. a) Explain the various constraints by giving examples

(or)

b) Find an expression for the period of a simple pendulum using Lagrange's equation.

12. a) Give the physical significance of Hamiltonian function.

(or)

b) Derive Hamilton's canonical equations.

13. a) Prove that $\beta(m,n) = \beta(n,m)$

(or)

b) Prove that $\beta(m,n) = \dfrac{\Gamma m\ \Gamma n}{\Gamma m+n}$

14. a) Prove that the Eigen values of Hermitian matrix are real

(or)

b) If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ prove that A.(adj A) = (adj A). A

15. a) Given $V = \dfrac{x\vec{i} + y\vec{j}}{x+y}$ find V.V

(or)

b)Prove that $V = 3y^4z^2\ \vec{i} + 4x^3z^2\vec{j} - 3x^2y^2\vec{k}$ is a solenoidal vector.

**SECTION C (Answer all the questions) (5 x 12 = 60)**

16. a) Explain generalized coordinates. Derive Lagrange's equation.

(or)

b) Discuss the problem of Linear harmonic oscillator by Lagrange's approach.

17. a) Using Hamillonian equation of motion obtain the period of oscillation of a compound pendulum.

(or)

b) Define phase space. Obtain Hamilton's canonical equation of motion.

18. a) Prove that $\beta\left(m,\frac{1}{2}\right) = 2^{2m-1}\ \beta(m,m)$. Hence find $\Gamma(2m)$

(or)

b) (i) Evaluate $\int_0^1 \dfrac{dx}{\sqrt{1-x^4}}$

(ii) Evaluate $\int_0^1 \dfrac{dx}{\sqrt[n]{1-x^n}}$

19. a) Find the characteristics equation of the matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$ and hence find. $A^{-1}$.

(or)

b) Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 1 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$

20. a) State and prove Guass Divergence Theorem.

(or)

b) State and prove Stoke's Theorem.

## APPLIED ELECTRONICS

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. In a CE amplifier, the phase difference between voltage across collector load $R_c$ and signal voltage is _____
   a) $180^o$ b) $270^o$ c) $90^o$ d) $0^o$
2. For an oscillator to properly start, the gain around the feedback loop must initially be _____
   a) 1 b) greater than 1 c) less than 1
   d) equal to attenuation of feed back circuit
3. A JFET has ____ power gain
   a) small b) very high c) very small d) none of the above
4. In a JFET, when drain voltage is equal to pinch – off voltage, the depletion layers _____
   a) almost touch each other b) have large gap
   c) have moderate gap d) none of the above
5. The main disadvantage of a mechanical switch is that it _____
   a) is operated mechanically b) is costly c) has high inertia d) none of the above
6. A monostable multivibrator has _____
   a) no stable state b) one stable state c) Two stable states d) None of the above
7. If the input to a differentiating circuit is a triangular wave, then the output wave will be
   a) square wave b) rectangular wave c) sawtooth wave d) none of the above
8. The clamper circuit is used to
   a) introduce a d.c. level to a.c. signal
   b) Suppress variations amplitude of the input signal
   c) obtain an output which is integral to the input signal
   d) none of the above
9. A triac can be triggered into conduction by applying
   a) only positive voltage at the gate
   b) positive or negative voltage at the gate
   c) positive or negative voltage at wither main terminal
   d) both (a) and (c) above.
10. Which of the following acts like a diode and two resistors
    a) SCR b) triac c) diac d) UJT

**SECTION – B ( 5 x 6 = 30)**

**Answer all the Questions**

11. a) Draw the circuit of practical single stage transistor amplifier. Explain the function of each component.

[or]

b) What is an oscillator? What is its need ? Discuss the advantage of oscillators?

12. a. Explain the construction and working of a JFET?

[or]

b. Explain the construction and working of MOSFET.

13. a) Explain the terms collector leakage current and saturation collector current.

[or]

b) What is the basic difference among the three types of multivibrators.

14. a) What do you mean by the term "wave shaping"? also discuss why it is needed in practical applications.

[or]

b) Sketch out the waves forms for an integrating circuit when the input signal is (i) Square wave and (ii) a rectangular wave

15. a) Explain the construction and working of a diac?

[or]

b) 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 $V_{BB}$ = + 18V. Take $V_D = 0.7$ V.

**SECTION – C (5 x 12 = 60)**

**(ANSWER ALL THE QUESTIONS)**

16. a) Draw neatly the configuration of push- pull amplifier and explain its working.
Derive an expression for its efficiency.

[or]

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

17. a. (i) Give the construction and working of JFET.
(ii) What are the difference between JFET and Bipolar transistor

[or]

b. Explain SCR. Describe the important terms which are used to study SCR.

18. a) (i) Explain the switching action of transistor.
(ii) How a schmitt trigger is different from a multivibrator?

[or]

(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 $R_1 = R_2 = 4.7\text{k}\Omega$ and $C_1 = C_2 = 270$ pF

19. 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

[or]

b) (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.

20. a) (i) Explain the construction and working of a Triac

(ii) Explain the V- I characteristics of diac.

[or]

b) (i) What is a unijunction Transistor (UJT)? How does it differ from a JFET?

(ii) Explain the V- I characteristics of UJT. Why it is called a current controlled negative resistance device?

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## SOLID STATE PHYSICS

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

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The number of nearest neighbours for a lattice is _____
   a) bcc, 8 b) fcc, 10 c) hcp, 8 d) fcc, 4
2. The miller indices of the diagonal plane of a cube are
   a) 110 b) 100 c) 111 d) 011
3. The electrical conductivity of a conductor may be increased by,
   a) increasing its temperature b) decreasing its temperature
   c) increasing its vibrations d) decreasing its temperature and vibrations.
4. Above the curie temperature , a magnetic material becomes
   a) ferromagnetic b) paramagnetic c) diamagnetic d) none of the above
5. Materials which have permanent magnetic dipoles are called
   a) diamagnetic b) ferromagnetic c) semi magnetic d) none of the above
6. Super conductivity is observed for
   a) d.c and low frequencies b) high frequencies
   c) infra red frequencies d ) none of these
7. At critical temperature Tc, the value of critical magnetic fields Hc is,
   a) zero b) infinity c) some non zero value c) none of the above.
8. Electrical conductivity $\sigma$ of a conductor at absolute temperature T is related to its thermal conductivity k as
   a) $(k/\sigma T) = L$ b) . $\sigma kT = L$ c) $(\sigma/kT) = L$ d) none of the above
9. The total energy E of an electron in an atom is given by
   a) $E = (h/mv)$ b) $E = (k^2 h^2 / \pi^2 m)$
   c) $E = (k^2 h^2 / 8\pi^2 m)$ d) $E = (8\pi^2 m / k^2 h^2)$
10. Which of the following element has the highest electro negativity?
    a) As b) Bi c) Ca d) P

**SECTION – B ( 5 X 6 =30)**

**(Answer all the questions)**

11. a. Explain the term symmetry in crystal structure. Show that a five fold symmetry is not possible in crystal structures.

OR

b. i) Define the terms 1. unit cell 2. space lattices 3. miller indices.
   ii) sketch the planes (111), (212 )

12. a. Discuss the classical theory of specific heat of solids

OR

b. Give a brief note on energy bands in solids.

13. a. Deduce Wiedmann Franz law.

OR

b. Explain Hall effect.

14. a. Explain Dia magnetism and give the properties of dia magnetic materials.

OR

b. Give an account on Weiss theory on ferromagnetism

15. a. Deduce Clausius Mosotti relation

OR

b. Explain super conductivity

**SECTION – C (5 x 12 =60)**

**(Answer all the questions)**

16. a. Explain miller indices. How will you determine them?

OR

b. Describe the structures of sodium chloride crystal and distinguish between atom sites and lattice points in a mono atomic fcc crystal and NaCl crystal.

17. a) Explain Einstein's theory of specific heat of solids

OR

b) i) Give optical properties of solids
ii) What is Fermi level-Explain

18. a) Explain in detail about thermal conductivity and derive an expression for the coefficient of thermal conductivity k

OR

b) Explain the experimental determination of Hall coefficient

19. a) Distinguish between dia , para ,ferro and ferri magnetic materials. Mention their applications

OR

b) Explain Langevin's theory of diamagnetism

20. a) Write short notes on
i) Meissner's effect ii) Josephson effect
iii) Squids and their applications iv)Magnetic levitation

OR

b) Explain
i) Isotopes effect ii) Thermodynamic effect.

## PRINCIPLES OF DIGITAL ELECTRONICS

**Time : Three Hours** **Maximum : 75 marks**

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The simplified Boolean expression for Y = A +Ab is
(a) B b) A c) A+B d) AB

2. An octet group contains
a) eight adjacent zeroes b) eight adjacent ones
c) four adjacent zones d) four adjacent ones

3. The gate which is used to check parity is
a) AND Gate b) OR gate c) NOT gate d) Ex-OR gate

4. The chip used as common anode segment decoder driver is IUC
   a) 7446 b) 7448 c) 74147 d) 74148
5. The two's complement of the number 1110 1100 is
   a) 0111 1111 b) 00001 0100
   c) 11001010 d) 0011 0101
6. Sign magnitude numbers are used in
   a) A/D conversion b) D/A conversions
   c) XOR gate d) Half adder circuits
7. The illegal state associated with RS Flip flop is
   a) R = 0, s=1 state b) R=1, S=0 State
   c) R=1, S=1 State d) R=0, S=0 State
8. The number of output conditions for a counter using n flip flops is
   a) $2^n$ b) $2^n$-1 c) $2^{n-1}$ d) $2^n$-$2^1$
9. A D/A converter which uses a varying analog signal instead of a fixed ref. voltage is called.
   a) Multiplying D/A counter b) Dividing A/A converter
   c) R- 2R Ladder type d) None of the above
10. RAM is a
   a) Volatile memory b) non-volatile memory
   c) R – 2R ladder type d) None of the above

**SECTION – B ( 5 x 3 = 15)**

**(Answer all the questions)**

11. a) Write down any six steps to be followed while simplifying the Boolean equations with the help of the K – map

(or)

b) Draw the truth table and logic symbol of the NAND and NOR gates

12. a) What is a demultiplexer? Explain the action of 1 to 16 decoder with the help of a circuit diagram?

(or)

b) Write short notes on ASCII code :

13. a) Explain the action of three input XOR gate with the help of a circuit diagram?

(or)

b) What are the unsigned Binary numbers? Explain with an example.

14. a) Explain the action of D – flip flop with a circuit and truth table?

(or)

b) Explain the action of mode counter with a neat sketch?

15. a) What are the four type of RAM. Explain

(or)

b) Write short notes on ROM, PROM and EPROM

**SECTION – C ( 5 x 10 = 50)**

**(Answer all the questions)**

16. a) State and verify Demorgans' Theorem.

(or)

b) $Y = \overline{A}BC + A\overline{B}C + AB\overline{C} + ABC$. Use Sum of product method to simplify the above Boolean Equations. Draw K- Map and Sampling.

17. a) Write in detail about programmable array logic.

(or)

b) Convert the following to B.Nos

i) $738_{10}$ ii) $0.363_{10}$ iii) $33.4507_{10}$ iv) $26.03_{8}$ v) 8BED

18. a) Explain the working of adder subtractor circuit with the help of a circuit.

(or)

b) Explain the action of full adder circuit with a neat circuit diagram.

19. a) Discuss the action of JK flip flop and explain how racing condition is avoided in JK master slave Flip Flop.

(or)

b) What are the different types of registers explain?

20. a) Discuss the action of A/D converter.

(or)

b) Discuss the action of binary ladder D/A converter.

## APPLICATION ORIENTED SUBJECT – 2
## PRINCIPLES OF PROGRAMMING CONCEPTS AND C PROGRAMMING

**Time : Three Hours** **Maximum : 75 marks**

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Every C statement terminate with _____
   a) **.** b) ; c) : d) None
2. The number of operators are _____
   a) 4 b) 5 c) 3 d) 6
3. _____ ensures a signed decimal integer is printed correctly.
   a) %c b) %d c) %f d) %0
4. In a printf statement the use of %5.2f means
   a) five digits I all with 2 decimals
   b) five digits before decimal and 2 digits after decimal.
   c) Seven digits in all with 2 digits after decimals
   d) None of the above
5. _____ flag is presented of the output is left justified within the field and remaining field will be blank.
   a) - b) + c) 0 d) ≠
6. Skip the following statements and continuous with the next iteration
   a) continue statement b) break statement
   c) switch statement d) None
7. The _____function returns the length of string
   a) sprints b) strlen c) size of d) Malloc
8. The _____ function is used to write a set of data values to a file
   a) fsprintf b) getc c) getw d) ftell
9. The mode _____ is used for opening a file for reading
10. variables declared inside a function are known as _____
    a) Local b) global c) both d) None

**SECTION – B (5 X 3 = 15)**

**(Answer all the questions)**

11. a) Define the declaration of the different types of variables with example

(or)

b) Define the character sets used in C language.

12. a) Explain 4 basic types of constants in C.

(or)

b) Describe integer arithmetic expression and data types with an example.

13. a) Differentiate between if and if –else statement with suitable example.

(or)

b) Write a programs to find a biggest number among given three numbers

14. a) Discuss about the strings and character arrays

(or)

b) write a programs to find sum of n numbers

15. a) Give a brief account on function in C

(or)

b) Write a program to find $S = 1 - \frac{1}{1!} + \frac{2}{2!} + .... \frac{n}{n!}$

**SECTION – C (5 x 10 = 50)**

**(Answer all the questions)**

16. a) Explain the structure of a c program

(or)

b) Explain various data types and variables in C.

17. a) Explain assignment operator with example

(or)

b) Write a program to calculate area of triangle which sides are different.

18. a) Discuss in details on looping statements in C with suitable example

(or)

b) Write a recursice function to find the GCD of two numbers

19. a) Explain string & character handling with example

(or)

b) Write a C program to check given string is palindrome or not

20. a) Write a program to convert Farenheit to centigrade and vice versa using menu.

(or)

b) Write a program to find mean and SD for a given set of numbers

**DIPLOMA PAPER – INSTRUMENTATION III**

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

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. The output of the log amplifier would changed by
   a) $\Delta v = 4.3$ mv b) $\Delta v = 3.4$ mv c) $\Delta v = 4.3$ v d) $\Delta v = 3.4$ v
2. Monotonic behaviour requires that the differential non-linearity is
   a) > 1 LSB b) < 1 LSB c) Zero d) Infinity
3. The main drawback of the direct method in magnetic recorder is its poor _____ ratio.
   a) noise to signal b) signal to noise c) both a & b d) None of the above
4. Type bar printers typically have a speed of
   a) 100 – 200 lines / minute b) 10 – 20 lines / minute
   c) 10- 100 lines / minute d) 10 – 2100 lines / minute
5. The deflection of the pointer produced in moving iron type instrument is proportional to

a) current b) voltage c) resistance d) None

6. The Name Nixies mentioned in Gas discharge plasma display is actually its
   a) Anode b) Not cathod c) Cold cathod d) None of the above
7. The output of the Schimitt trigger in time base selector is
   a) $10^6$ pulse / S b) $10^5$ pulse / S c) $10^7$ pulse / S d) $10^1$ pulse / S
8. The relation between the gate period and the number of pulses produced in digital tachometer is
   a) P = 60 /G b) P = G /60 c) G = P / 60 d) G = 60 / P
9. Which type of phosphor of the oscilloscope is designed as blue shoot
   a) $P_1$ b) $P_2$ c) $P_6$ d) $P_{11}$
10. CRT ac voltage is obtained from the HV dc supply through voltage dividers
    a) $R_1 – R_3$ b) $R_1 – R_2$ c) $R_1 – R_5$ d) $R_1$- $R_4$

**SECTION – B (5 X 6 = 30)**

**ANSWER ALL QUESTIONS**

11. a) Explain briefly logarithmic compression method in signal conditioning of the inputs

    [or]

    b) Write notes on i) Mulitplexers ii) Sample hold circuit
12. a) Write notes on i) Graphic recorder ii) Magnetic recorder

    [or]

    b) Give the short notes about disk files and floppy disk
13. a) Taut Band Instrument – Explain

    [or]

    b) Write notes on i) LED ii) LCD
14. a) Write short notes on Digital panel meter

    [or]

    b) Write about Digital tachometer
15. a) Explain and sketch the block diagram of oscilloscope

    [or]

    b) Explain briefly about CRT connections.

**SECTION – C (5 x 12 = 60)**

**ANSWER ALL QUESTIONS**

16. a) Define the construction and working of digital to analog converter.

    [or]

    b) Explain briefly multi channel acquisition system.
17. a) What do you mean by Graphic recorder. Give the theory of optical oscillograph. Describe X- Y Recorder.

    [or]

    b) Give the theory about line printer.
18. a) Write about Electrodynamometer.

    [or]

    b) Explain the process of segmental displays using LED’s.
19. a) Explain about the digital frequency meter.

    [or]

    b) Explain the automation in digital instalments
20. a) What are the basic principle of signal display. Explain

    [or]

    b) How can be measure the frequency, capacitance inductance and voltage using storage oscilloscope

## QUANTAM MECHANICS AND RELATIVITY

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

**SECTION – A** **(10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Pick out the wrong statement
   a. Old quantum theory can explain photo electric effect
   b. Old quantum theory can explain spoectra of helium and more complex atoms.
   c. Old quantum theory was proposed by Max Planck
   d. Old quantum can explain Compton effect
2. De Broglie's relation is
   a. $P = \frac{h}{c}$ b. $\lambda = \frac{h}{p}$ c. $\frac{\lambda}{hc}$ d. $\lambda = \frac{P}{h}$
3. Group velocity is given by
   a. $\frac{dw}{dk}$ b. $\frac{w}{k}$ c. $\frac{dv}{d\lambda}$ d. $\frac{h}{p}$
4. Uncertainty principle is
   a. $\Delta p.\Delta x \geq h$ b. $\Delta p.\Delta E\Delta \geq h$ c. $\Delta E.\Delta p \geq h$ d. $\Delta E.\Delta x \geq h$
5. Quantum mechanical operator for momentum is
   a. $-ih\nabla$ b. $ih\nabla$ c. $ih\frac{\partial}{\partial t}$ d. $-ih\frac{\partial}{\partial t}$
6. If $\psi_m$ and $\psi_n$ are two orthogonal eigen functions then
   a. $\int \psi_m \psi_n^* \, dT = 1$ b. $\int \psi_m \psi_n^* \, dT = 0$
   c. $\int \psi_m^* \psi_m = 0$ d. $\int \psi_n^* \psi_n = 0$
7. The eigen values of energy of a particle in a rectangular three dimensional box is given by
   a. $\frac{\pi^2 h^2}{2m}\left[\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} + \frac{n_z^2}{c^2}\right]$ b. $\frac{\pi^2}{2m}\left[\frac{n_x^2}{a} + \frac{n_y^2}{b} + \frac{n_z^2}{c}\right]$
   c. $\frac{\pi h^2}{2m}\left[\frac{n_x}{a} + \frac{n_y}{b} + \frac{n_z}{c}\right]$ d. $\frac{\pi^2 h^2}{2m}\left[n_x + n_y + n_z\right]$
8. Legendre polynomials are used in the solution of
   a. radial wave equation of hydrogen atom
   b. azimuthal wave equation of hydrogen atom
   c. polar wave equation of hydrogen atom
   d. all the three
9. Relativistic law of addition of velocities applies
   a. to velocities in opposite directions
   b. to velocity of any value
   c. to two velocities in the same directions
   d. to all velocities
10. If a lift goes down with an acceleration equal to 'g', then the mass of a body inside the lift is equal to
    a. m (g ± a) b. infinity c. m itself d. zero

**SECTION – B ( 5 X 6 = 30)**

**(Answer all the questions)**

11. a. State three reasons for the failure of classical mechanics

[or]

b. State three drawbacks of old quantum theory

12. a. Give the elementary proof of uncertainty principle

[or]

b. Show that electrons cannot be present inside the nucleus

13. a. What are normalized and orthogonal eigen functions?

[or]

b. Define probability current density

14. a. What are degenerate states? Give example

[or]

b. Write down the azimuthal part of the wave equation of hydrogen atom.

15. a. Show that acceleration is invariant under Galilean transformation

b. Explain the physical significance of the Mass energy equivalence.

**SECTION C (5 X 12 = 60)**

**(Answer all the questions)**

16. a. Describe G.P. Thomson's experiment on existence of electron waves.

[or]

b. Explain De Broglies hypothesis and obtain De Broglies relation. Explain its physical significance

17. a. Illustrate uncertainty principle by two thought expts.

[or]

b. Obtain i) size of hydrogen atom ii) energy of hydrogen atom in ground state using uncertainty principle

18. a. Obtain the time dependent schrodinger's equation for a free particle

[or]

b. Explain the concept of operators in quantum mechanics with examples

19. a. Solve the schgrodinger equation for particle in a rectangular three dimensional box and obtain the eigen values

[or]

b. Obtain the solution of polar wave equation for hydrogen atom.

20. a. Explain Michel – Morely experiment. How is the 'negative' result explained? [or]

b. Derive the relation, $m = \frac{m_o}{\sqrt{1-\frac{v^2}{c^2}}}$ and explain its consequences.

## NUCLEAR PHYSICS

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

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1 Substances having same mass number but different chemical properties are called

a) isobars b) isotopes c) decay elements d) all the above

2. Mass defect Δm is
   a) Δm= m-A b) Δm = A-m c) Δm =Z-A d) A-Z
3. The most widely known and widely used particle detector is
   a) Cyclotron b) Betatron c) ionization chamber d) Synchro cyclotron
4. Betatron is used to accelerate
   a) α particle b) proton c) neutrino d) electron
5. The half life of carbon 14 is
   a) 5570 b) 4570 c) 7470 d) 5900
6. The velocity of alpha particle is
   a) (1/10) c b) (1/18) c c) (1/28) c d) (1/30) c
7. Fission reactions are produced by neutrons with of energy _____
   a) 0.7 MeV b) 0.2 MeV c) 0.1 MeV d) 0.5 MeV
8. To produce an atom bomb the mass of Uranium 235 is
   a) > critical value b) < critical value
   c) = critical value d) none of the above
9. The energy of primary cosmic rays is
   a) $10^{11}$ MeV b) $10^{5}$ MeV c) $10^{3}$ MeV d) $10^{6}$ MeV
10. The wave length λ of an annihilation radiation is given by
    a) 2.4 A° b) 0.24 A° c) 0.024 A° d) 0.0024 A°

**SECTION – B (5 X 6 = 30 marks)**

**(Answer all the questions)**

11. a) Describe proton neutron theory of nuclear compositions.

    OR

    b) Explain the meson theory.
12. a) Write a note on heavy charged particle

    OR

    b) Describe the GM counter and explain its working
13. a) Write the properties of Beta rays

    OR

    b) Explain half life period, mean life, and obtain the relationship between them
14. a) Explain nuclear chain reaction..

    OR

    b) Explain Carbon Nitrogen cycle
15. a) Explain the origin of Cosmic rays

    OR

    b) Explain pair production and pair annihilation

**SECTION – C (5 X 12 = 60 marks)**

**(Answer all the questions)**

16. a) Explain the general properties of Nucleus.

    OR

    b) Discuss the cell model of nucleus and explain its properties
17. a) Describe the Ionisation chamber with a diagram and explain its working.

    OR

    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.

18. a) Describe the Dumond spectrometer to measure the wave length of gamma rays.

OR

b. Explain artificial radioactivity and write the application of radio isotopes.

19. a) Explain Bohr and Wheeler's theory of nuclear fission.

OR

b) Explain the function of Atom bomb and Hydrogen Bomb with an equation.

20. a) Describe Primary and Secondary Cosmic rays

OR

b) Explain the fundamental interactions and the Quark model.

## APPLICATION ORIENTED SUBJECT – 3
## MICROPROCESSOR

**Time : Three Hours** **Maximum : 75 marks**

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. In micro computer, the user writes a sequence of instruction known as _____
   a. data b. program c. logic d. ALU
2. In the decimal number system,, the weight of each position is some power of _____
   a. 1 b. 2 c. 10 d. 8
3. The Intel 8085 microprocessor can directly address _____ bytes of memory.
   a. 50k b. 64k c. 74k d. 1124k
4. The programmes are written by 'C' and 'Pascal' are known as
   a. High level language b. Machine language
   c. low level language d. None
5. The time required to read a word of information from a fast primary memory is _____
   a. 10 ns b. 50 ns c. 10ms d. 100ns
6. The cell retains the information until it is overwritten or electrical power is taken off the chip
   a. Static RAM b. Dynamic RAM c. ROM d. None
7. The role of microprocessor in a microcomputer system is
   a. ALU b. CPU c. Program d. None
8. Which of the following can be used efficiently for storing and retrieving return addresses during nested calls to subroutines
   a. Register b. Accumulator c. Stack d. ALU
9. In an 8086 / 8088 based system, the maximum number of words are ___
   a. 712 k b. 102k c. 600k d. 512k
10. When the I / O device and the up match in speed under data transfer becomes
    a. asynchronous b. synchronous c. direct memory d. none

**SECTION – B ( 5 X 3 = 15)**

**(Answer all the questions)**

11. a. Give short note on arithmetic logic unit.

[or]

b. Explain the character representation.

12. a. Explain the addressing mode of the I / O devices.

[or]

b. Describe the instruction set of the 8085.

13. a. Discuss the theory of memory organization

[or]

b. what are the timing parameters ? and Explain.

14. a. What are instruction and data flow ?

[or]

b. Give a short note on TMS 9900 work space pointer concept

15. a. What is an address space ?

[or]

b. Give a short note on asynchronous data transfer

**SECTION – C (5 x 10 = 50)**

**Answer All Questions**

16. a. Explain the organization of micro computer in detail

[or]

b. Give the note on

i) Positional number systems

ii) Representation of floating point numbers

17. a. Discuss the organization of the 8085 in detail.

[or]

b. Give the brief note on Register addressing and register indirect addressing

18. a. Explain memory system organization in microprocessor

[or]

b. How will you analyse the timing characteristics of memories ?

19. a. Explain the timing and control unit of a micro computer.

[or]

b. Describe the opcode fetch cycle in 8085 microprocessor .

20. a. Give the detailed note of the following

i) the address map

ii) Address decoding

[or]

b. Describe the memory interfacing in detail

## OBJECT ORIENTED PROGRAMMING IN C++

**Time : Three Hours** **Maximum : 75 marks**

**SECTION – A (10x1=10)**

Answer All Questions

Choose the Correct Answer

1. Which one of the following is an object -based language

a) C++ b) Small talk c) Ada d) C

2. The approach which the object oriented programming used for program design is _____

a) Botton-up b) top- down c) both d) None

3. Which of the following is not a user defined data type

a) Structures b) Enumerated c) Classes d) None

4. In object oriented programming, programs are divided into

a) classes b) Objects c)Functions d) Data

5. _____OOP concept provides the idea of reusability.
6. Let integer be a class statement – integer (integer & i); is a
   a) Pass by reference b) Destructor
   c) Dynamic Constructor d) copy constructor
7. Which is an odd one
   a) Early binding b) Dynamic binding
   c) Static binding d) Compile time polymorphism
8. ____ operator cannot be overloaded using friend function
   a) = b) << c) == d) +
9. Which notation is used in C++ for typecast operation.
   a) typename (expression) b) Type-name (expression
   c) tn (expression) d) None
10. Name the arguments that are used in main ( ) function.
    a) arg v b) arg c c) both d) None

**SECTION – B (5 x 3 = 15)**

**(Answer all the questions)**

11. a) Compare object oriented programming with other programming concepts.

(or)

b) List out the structure of C++ programming with suitable example.

12. a) Discuss briefly on Inline function with example.

(or)

b) List out any 5 math library functions with example.

13. a) Brief note on constructor and destructor.

(or)

b) Write a C++ program to calculate an acceleration with a body of mass(m) is acted on by a force (f).

14. a) Short Note on "this pointer" with example .

(or)

b) Write a C++ program to implement single inheritance with proper application

15. a) Describe briefly on unformatted I / O operations

(or)

b) Write a program to create a data file containing the list of telephone number with name (Use a class object to store each set of data)

**SECTION – C ( 5 X 10 = 50)**

**(Answer all the questions)**

16. a) List the application and special features of object oriented programming

(or)

b) Write a C++ program to generate the following o / p.

17. a) Discuss function overloading with suitable example.

(or)

b) Write a C++ program to print the list of books in a library (using array of objects)

18. a) Get the m x n i /p matrices to perform arithmetic operations using operator overloading

(or)

b) Describe type conversion with suitable example

19. a) Explain inheritance with example.

(or)

b) Write a C++ program to find the area of rectangle, circle and square using polymorphism.

20. a) Write a C++ program to find the complex number arithmetic operation such as addition, subtraction, multiplication, division, can be done by suing overloading with friend function.

(or)

a) Write a C++ program to convert Fahrenheit to Centigrade and Voice versa.