JMJ COLLEGE FOR WOMEN (AUTONOMOUS), TENALI.
I B.SC., PHYSICS SYLLABUS w.e.f 2015-2016
I SEMESTER - PAPER-I
MECHANICS, WAVES & OSCLLATIONS

UNIT-I **12hrs**

VECTOR ANALYSIS

Scalar and Vector fields, Gradient of a scalar field and its physical significance, Divergence and curl of a vector field -derivations, vector Integration – Line, surface and volume Integrals, Stokes, Gauss and theorems- Statements and proof.

MECHANICS OF PARTICLES

Laws of motion, Motion of variable mass system, Motion of a Rocket, Multi stage Rocket, conservation of energy and momentum, Collisions in two and three dimensions Concept of impact parameter, Scattering cross-section, Rutherford's scattering formula-derivation.

UNIT-II **12hrs**

MECHANICS OF RIGID BODIES

Definition of a Rigid body – Rotational kinematics relations, Equation of motion of rotating body, angular momentum, Euler's equation, Precession of a top, Gyroscope, Precession of Equinoxes.

UNIT-III **12hrs**

FUNDAMENTALS OF VIBRATIONS

Simple Harmonic Oscillator and the solution of the differential equation, physical characteristics of SHM, Frequency of loaded spring taking its mass into consideration.

COMBINATIONS OF MOTIONS

Combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajou's figures – Its applications (qualitative treatment)

UNIT-IV **12hrs**

DAMPED VIBRATIONS

Damped harmonic oscillator, Solution of the differential equation of a damped oscillator, Energy considerations, Logarithmic decrement, relaxation time, quality factor.

FORCED OSCILLATIONS

Differential equations of forced oscillator and its solutions, Amplitude resonance, velocity resonance.

UNIT-V **12hrs**

COMPLEX VIBRATIONS

Fourier's theorem and evaluation of the Fourier's coefficients, Analysis of periodic wave functions- Square wave function, Triangular wave, saw tooth wave.

List of reference books:

1. B.Sc., Physics Vol. I-Chand Co.
   By C. Murali Mohan Sastry, K. Sankara Rao & P. Babu Rao
2. First year physics – Telugu Academy
3. Unified Physics Vol. I
   Jaiprakash Nath & Co. – Dr. S.L. Gupta & Sanjeev Gupta.
4. Mechanics of particles, waves & oscillations. New Age International Publisher.

JMJ COLLEGE FOR WOMEN (AUTONOMOUS), TENALI.

I Semester End Examination

Subject : Physics **Paper I - Mechanics, Waves & Oscillations**

Time : 3 Hrs. **I B.Sc A,B,MPComp**

Model Question Paper **Max. Marks: 70**

Section-A

I Answer any Five of the following. 5x3=15M

1. Define gradient of a vector field. Explain its physical significance.
2. Describe the principle of motion of a rocket as a system variable mass.
3. Write a note on Gyroscope.
4. Explain relaxation time.
5. Explain amplitude resonance.
6. Give the important characteristics of simple harmonic motion
7. What are Lissajou's figures? What are its uses?
8. Derive Euler's equations of rotational motion for a rigid body.

Section-B

II Answer the following questions. 5x11=55M

9. a) State and Prove divergence theorem. Give its physical significance.

If A= $\bar{\imath}y + \bar{\jmath}\ (x^2 + y^2) + \bar{k}\ (yz + zx)$ then find div A at point (1,-2, 3).

Or

b) Derive an expression for Rutherford's scattering .

A rocket burns 0.02 kg of fuel per sec ejecting it as a gas with a velocity of 10,000 m/sec. What force does the gas exert on the rocket?

10. a) Explain the precession of a symmetric top. Obtain an expression for its Precessional frequency.

Or

b) Define rigid body. Derive the equation of motion of a rigid body about the axis of symmetry.

11. a) Derive the equation of motion of simple harmonic oscillator and find its solution.

A spring stretched by 8 cm by a force of 10 N. Find the force constant. What will be the period of a 40 Kg mass suspended by it?

Or

b) Define simple harmonic motion. Discuss the combination of two mutually perpendicular simple harmonic vibrations of same frequency with diagrams.

The displacement of the particle executing SHM is given by x = 10cos ($4\boldsymbol{\pi}$t + $\frac{\boldsymbol{\pi}}{\mathbf{3}}$) m. find the frequency and the displacement after a time one second.

12. a) What are damped oscillations? Derive the equation of motion of damped oscillator and find its solution. Discuss the critical damping condition.

The amplitude of a seconds pendulum falls to half initial value in 150 sec. Calculate the Q-factor.

Or

b) What are forced oscillations? Derive the equation of motion of a forced oscillator and find its solution.

The quality factor of a sonometer wire is 2×10^3. On plucking it makes 240 vibrations per second. Calculate the time in which amplitude decreases to half the initial value. ($\text{Log}_e 10 = 2.3$)

13. a) State Fourier's theorem. Analyse a square wave with the help of Fourier's theorem.

Or

b) Evaluate Fourier coefficients. What are its limitations?

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JMJ COLLEGE FOR WOMEN (AUTONOMOUS),TENALI.
I B.SC., PHYSICS SYLLABUS w.e.f 2015-2016
II SEMESTER –PAPER -II
MECHANICS, WAVES & OSCLLATIONS

UNIT-I **12hrs**

MECHANICS OF CONTINUOUS MEDIA

Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k and poission's ratio limitations

BENDING:

Types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

UNIT-II **12hrs**

CENTRAL FORCES

Central forces - definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, motion of satellite, motion under inverse square law, Derivation of Kepler's laws.

UNIT-III **12hrs**

SPECIAL THEORY OF RELATIVITY

Galilean relativity, search for absolute frames of reference, Michelson-Morley experiment and negative result explanation, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities,mass-energy relation.

UNIT-IV **12hrs**

VIBRATIONS OF BARS

Longitudinal vibrations in bars-wave equation and its general solution, special cases (i) bar fixed at both ends ii) bar fixed at the midpoint (iii) bar free at both ends (iv) bar fixed at one end.

UNIT-IV **12hrs**

VIBRATIONS OF STRINGS

Transverse velocity of wave propagation along a stretched string, general solution of Wave equation and its significance, modes of vibration of stretched string clamped at both ends, overtones, energy transport, transverse impedance or characteristic impedance.

UNIT-IV **12hrs**

ULTRASONICS

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by Piezoelectric and Magneto-striciton methods, detection of ultrasonics, determination of wave length of ultrasonic waves. Applications of ultrasonic waves.

List of reference books :

1. B.Sc., Physics Vol. I-Chand Co.
   By C. Murali Mohan Sastry, K. Sankara Rao & P. Babu Rao
2. First year physics – Telugu Academy
3. Unified Physics Vol. I
   Jaiprakash Nath & Co. – Dr. S.L. Gupta & Sanjeev Gupta.
4. Mechanics of particles, waves & oscillations. New Age International Publisher.

JMJ COLLEGE FOR WOMEN (AUTONOMOUS), TENALI.

II Semester End Examination

Subject : Physics **Paper II - Mechanics, Waves & Oscillations**

Time : 3 Hrs. **I B.Sc MPC A,B,MPComp**

Model Question Paper **Max Marks:70**

Section-A

I Answer any Five of the following. 5x3=15M

1. What are the limitations of Poisson's ratio?
2. Show that the conservative force as a negative gradient of potential energy.
3. Explain time dilation.
4. Deduce Einstein's mass energy relation.
5. Explain the phenomenon of energy transport.
6. Discuss briefly the longitudinal modes of vibration of a bar Clamped at both ends.
7. State the applications of ultrasonics?
8. How will you determine the wavelength of ultrasonics?

Section-B

II Answer the following questions. 5x11=55M

9. a) Define the three modulii of elasticity and obtain the relation between them.
The Young's modulus of steel is $2x10^{11}$ N/m^2 and its rigidity modulus is $8x10^{10} N/m^2$ Find the Poisson's ratio and bulk modulus.

Or

b) Explain different types of beams and different types of loads.
A wire of 3m long and 0.625sq.cm in cross-section is found to stretch by 0.3cm under a tension of 1200Kg.What is the Young's modulus of the material of the wire.

10. a) State Kepler's laws of planetary motion. Deduce these laws using Newton's inverse square law of gravitation.
The mean distance of Mars from sun is 1.524 times the distance of the earth from sun. Compute the period of revolution of Mars around the sun.

Or

b) What are central forces? Show that central force is conservative force.
Show that the force $F= (y^2-x^2)\,\vec{i}+2xy\,\vec{j}$ is conservative.

11. a) Describe Michelson-Morley experiment & Discuss about its negative result .

Or

b) State the postulates of special theory of relativity. Derive the Lorentz transformation equations.

12. a) Derive an expression for the velocity longitudinal waves in a bar.
The density of aluminum is $2.8x10^3$ Kg/m^3 and its Young's modulus is $7x10^{10}$ Pascals. If the frequency of the rod is500 Hz.Calculate the velocity of sound and wavelength through the rod.

Or

b) Derive the equation for the velocity of transverse wave along a stretched string.

A steel wire 50 cm long has mass of 5 gm. If it is stretched with a tension of 400 N. Find the frequency of wire in fundamental mode of vibration.

13. a) Define Piezo-electric effect .Explain Piezo-electric method of producing ultrasonics and state any five applications

Or

b) Define ultrasonics. Describe the magneto- striction method of producing ultrasonics and write any four detection methods.

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JMJ COLLEGE FOR WOMEN (AUTONOMOUS), TENALI.

I Semester End Examination

Subject : Physics **Paper I - Mechanics, Waves & Oscillations**

I B.Sc.MPC A,B,MPComp

Practical paper I

1. Volume resonator
2. Viscosity of liquid – Poiseuille's method
3. Young's modulus- Uniform bending
4. Young's modulus- Non Uniform bending
5. Surface Tension of liquid by capillary rise method
6. Rigidity modulus – Dynamic method (Torsional pendulum)
7. Fly wheel

JMJ COLLEGE FOR WOMEN (AUTONOMOUS), TENALI.

II Semester End Examination

Subject : Physics **Paper II- Mechanics, Waves & Oscillations**

I B.Sc.MPC A/S,B/S,MPComp

Practical paper II

1. Determination of g by Compound pendulum
2. Simple pendulum – Estimation of errors
3. Sonometer – Verification of laws
4. Velocity of Transverse wave along a stretched string –Sonometer
5. Searl's Viscometer
6. Determination of frequency of a bar- Melde's experiment
7. Lissajous figures –CRO (Demonstration expt.)

JMJ COLLEGE FOR WOMEN (AUTONOMOUS): TENALI
II Year B.Sc., Physics Syllabus 2013-2014
PAPER-III THERMODYNAMICS AND OPTICS
SEMESTER-III

60 hrs (4hrs./week)

Thermodynamics

I. KINETIC THEORY OF GASES (7) :

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Experimental verification- Toothed Wheel Experiment, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

II. **THERMODYNAMICS (7) :**

Introduction – Reversible and irreversible processes – Carnot's engine and its efficiency – Carnot's theorem – Second law of thermodynamics, Kelvin's and claussius statements – Thermodynamics scale of temperature.

III. ENTROPY(7):

Concept of Entropy, physical significance – change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature Entropy (TS) diagram – Change of entropy of a perfect gas.

IV. THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS (7)

Thermodynamic potentials – Derivaiton of Maxwells thermodynamic relations from thermodynamic potentials ,Derivation of maxwell's relations from the laws of thermodynamics – claussius Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats of a gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

OPTICS

V. THE MATRIX METHODS IN PARAXIAL OPTICS (7) :

Introduction, the matrix method, effect of translation , effect of refraction, , system matrix, position of the image plane and magnification of an optical system , application to simple optical system –thick lens and thin lens, system matrix for two thin lenses in contact and separated by a distance , Cardinal points of a lens system, Unit planes, Nodal planes.

VI. INTERFERENCE OF LIGHT –I (DIVISION OF WAVE FRONT) : (7) :

Interference of light, types of interference, Fresnel's biprism – determination of wave length of light. Determination of thickness of transparent material using biprism – change of phase on reflection (Stoke's law) – Lloyd's mirror experiment, distinction between bi prim and Lloyd's mirror fringes.

VII. **INTERFERENCE OF LIIGHT -II (DIVISION OF AMPLITUDE)(7):**

Interference of a plane wave by a plane parallel film ,Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – Interference by a film with two non parallel reflecting surfaces (Wedge shaped film), Determination of diameter of wire .

VIII. **INTERFERENCE OF LIGHT –III (DIVISION OF AMPLITUDE)(7):** Newton's rings –Explanation of the formation of the Newton's rings ,theory – Newton's rings by reflected light , Determination of wave length of monochromatic light using Newton's rings ,Michelson Interferometer – construction ,working and theory, types of fringes , uses of Michelson Interferometer –Determination of wave length of monochromatic light, difference in wave lengths and thick lens of a thin lens .

ABERRATIONS (4) : (For seminar not for examination)

Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet, coma.

Note: Problems should be solved at the end of every chapter of all units

Textbooks:

1. Optics by Subrahmanyam and Brijal.S. Chand & Co.
2. Optics by Ajoy Ghatak – Tata McGraw Hill
3. Second year Physics – Telugu Academy.

Reference books :

1. Unified physics – volume II, Thermodynamics & Optics – R.L. Guptha & S.L. Guptha.
2. Modern physics by R. Murugeshan & Kiruthig Siva Prasad S.Chand & Co.
3. For statistical mechanics A text books of B.Sc., Physics Vol II by Anwar Kamal & Ram Chander.

JMJ COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

III Semester

Sub : Physics Paper III (Thermodynamics and Optics)

Max. Marks : 70 Time : 3 Hrs.

Part-A

I Answer the following. 2x10=20M

1. a. State the basic assumptions of Kinetic theory of gases and derive Maxwell's distribution law of velocities ?

   Or

   b. Describe carnot's cycle. Obtain an expression for the efficiency of Carnot's ideal heat engine ?

2. a. What are thermodynamic potentials? Derive Maxwell's Thermodynamic relations from them ?

   Or

   b. What do you mean by specific heats of a gas ?Derive an expression for the difference of two specific heats of a gas from Maxwell's thermodynamic relations ?

Part-B

I1 Answer the following. 2x10=20M

3. a. What is the system matrix of an optical system? Deduce the system matrix for a thick lens and hence derive the thick lens formula.

   Or

   b. Explain the features of the interference pattern produced with a bi prism? How is the wavelength of monochromatic light determined using a bi prism .Derive the formula you use.

4. a. How Newton's rings are formed. Describe Newton's rings experiment to determine the wave length of a monochromatic light with necessary theory?

   Or

   b. Describe the construction and working of a Michelson's Interferometer? How wavelength of the light determine?

Part-C

III Answer any five of the following. 5x3=15M

5. Explain the property of viscosity of a gas on the basis of kinetic theory.
6. What is entropy? What are temperature entropy diagrams.
7. What is Joule-Thomson effect? Obtain expression for cooling produced when a gas suffers Joule-Thomson effect from Maxwell's Thermodynamic relations?
8. Write a note on Optical pyrometer?
9. Describe various cardinal points in a lens system.
10. Explain the phase change due to reflection of light from the surface of a denser medium?
11. Explain the formation of colours in thin films?
12. Write a note on non reflecting films?

Part-D

IV Answer any three of the following. 3x5=15M

13. The coefficient of viscosity of O_2 gas at 27^0c and pressure 105 Nm^{-2} is 4 x 10^{-5} kg/m-s. Calculate the diameter of O_2 molecule.
14. Calculate the change in melting point of ice, when it is subjected to a pressure of 100 atm, density of ice 0.917 gm/cm^3 and latent heat of ice is 336 J/gm.
15. On placing a thin sheet of mica of thickness 12 x 10^{-5} cm in the path of one of the interfering beams, the central fringe bright band is shifted to the position previously, occupied by the 5^{th} bright band. Find the thickness of the film.
16. In a Newton's ring experiment Sodium light of wavelength 5893A^0 is used. The diameters of the fifth and fifteenth dark rings are 0.55 mm and 5.10 mm respectively. Calculate the radius of curvature of the lens used.
17. The movable mirror of Michelson's interferometer is moved through a distance of 0.02603 mm. Find the number of fringes shifted across the cross wire of eye piece of the telescope, if a wavelength of 5206A^0 is used.

JMJ COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

II Year B.Sc., Physics Syllabus 2013-2014

PAPER-IV THERMODYNAMICS AND OPTICS

SEMESTER-IV THERMODYNAMICS 60 hours (4 hours/week)

I. LOW TEMPERATURE PHYSICS (7) :

Introduction – Joule Kelvin effect – liquefaction of gas using Porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – production of low temperatures – principle of refrigeration, vapour compression type. Working of refrigeration and Air conditioning machines. Effects of Chloro and Fluro Carbons on Ozone layer, applications of substance at low temperature.

II. QUANTUM THEORY OF RADIATION (8) :

Black body ,Ferry's black body – distribution of energy in the spectrum of Black body – Experimental results, Derivation of Wein's displacement law, derivation of Rayleigh-Jean's formula for energy distribution in a black body – Quantum theory of radiation, derivation of Planck's radiation law – deduction of Wein's law, Rayleigh-Jean's law from Planck's law.

III. PYROMETERY(6):

Measurement of radiation, Types of pyrometers – disappearing filament optical pyrometer –working and experimental determination of temperature, solar constant-Angstrom pyroheliometer- determination of solar constant, Effective temperature of sun.

IV. STATISTICAL MECHANICS (7) :

Introduction to statistical mechanics, concept of ensembles, Phase space, Maxwell Boltzmann's distribution law, Molecular energies in an ideal gas, Bose Einstein Distribution law, Fermi Dirac Distribution law, comparison of three distribution laws.

Application of Fermi Dirac statistics to white dwarfs and Neutron stars (For seminar purposes only).

OPTICS

V. FRAUNHOFFER DIFFRACTION (7) :

Introduction – difference between interference and diffraction., Fraunhoffer diffraction due to single slit and circular aperture – Limit of resolution – Fraunhoffer diffraction due to double slit – Fraunhoffer diffraction pattern with N slits (diffraction gating) Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

VI. FRESNEL DIFFRACTION (7):

Fresnel's half period zones – area of the half period zones – zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – Distinction between Fresnel and Fraunhoffer diffraction .

VII. POLARIZATION (7) :

Polarized light : Methods of polarization, polarization by reflection, refraction, double refraction, selective absorption, scattering of light – Brewsters law – Maulus law – Nicol prism as polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate, analysis

of polarized light – Babinet's compensator – Optical activity-Fresnel's theory of optical rotation , Laurent's half shade polarimeter.

VIII. LASERS AND FIBER OPTICS (7) :

Lasers: Introduction – Spontaneous and stimulated emissions – population inversion. Laser principle – Einstein coefficients – He-Ne laser – Ruby laser – Applications of lasers. **Fiber optics** : Introduction – optical fibers – Types of optical fibers – step and graded index fibers – Rays and modes in an optical fiber – Fiber materials – Principles of fiber communication (qualitative treatment only) and advantages of optical fiber communication over Electro magnetic communication.

HOLOGRAPHY: **(For seminar purpose only)**

Basic Principle of Holography – Gabor hologram ,recording and reconstruction of a hologram, Holography application.

Note: Problems should be solved at the end of every chapter of all units.

Textbooks

b. Optics by Subrahmanyam and Brijal.S. Chand & Co.
c. Optics by Ajoy Ghatak – Tata McGraw Hill
d. Second year Physics – Telugu Academy.

Reference books:

1. Unified physics – volume II, Thermodynamics & Optics – R.L. Guptha & S.L. Guptha.
2. Modern physics by R. Murugeshan & Kiruthig Siva Prasad S.Chand & Co.
3. For statistical mechanics A text books of B.Sc., Physics Vol II by Anwar Kamal & Ram Chander.

JMJ COLLEGE FOR WOMEN (AUTONOMOUS): TENALI

IV Semester End Examination

Sub : Physics **Paper IV (Thermodynamics and Optics)**

Max. Marks : 70 **Time : 3 Hrs.**

Part-A

I **Answer the following.** **2x10=20M**

1. a. What is adiabatic demagnetization? How is the principle used in producing low temperatures & give the necessary theory?

   Or

   b. Derive Planck's law of radiation? How does it explain Wien's law and Rayleigh – Jeans Law.

2. a. Define solar constant ? How is it determined experimentally ? How temperature of the sun is determined?

   Or

   b. Give the expression for Bose –Einstein distribution law? Apply it to a photon gas to obtain the energy distribution

Part-B

II **Answer the following.** **2x10=20M**

3. a. Describe fraunhoffer diffraction due to single slit .Deduce the positions of maxima and minima and draw intensity distribution graph ?

   Or

   b. Describe, with necessary theory, the Fresnel type of diffraction due to straight edge and explain the intensity distribution?

4. a. Explain the Huygen's theory of double refraction in uniaxial crystals ?

   Or

   b.What are the important characteristics of laser radiation ?Explain the working of He –Ne gas laser ?

Part-C

III **Answer any five of the following.** **5x3=15M**

5. Explain the principle involved in liquefaction of Helium.
6. Write a note on optical pyrometer .
7. Distinguish between Bose-Einstein and Fermi Dirac distributions.
8. State and explain wein's displacement law ?
9. What is a Zone plate? Compare its function with that of a convex lens
10. Write a note on quarter and half wave plates?
11. Distinguish between spontaneous and stimulated emission of radiation?
12. What is the advantage of graded index fiber over the step index fiber ?

Part-D

IV **Answer any three of the following.** **3x5=15M**

14. Calculate the temperature of inversion for helium gas. Given $a=3.44x10^{-3}$ nt-m^4/mol^2 and $b=0.0237x10^{-3}$ m^3/mol R=8.31joul/(mol-k)

15. Calculate the no. of modes of vibrations in wave length range $5000A^0$ to $5002A^0$ for radiation in a chamber of unit volume.
16. A plane diffraction grating is the first order shows an angle minimum deviation of 20^0 at the mercury blue line of wave length $4358A^0$. Calculate the number of lines per cm.
17. A zone plate has a focal length of 60 cm for wave length of $5893A^0$. Find the radii of first and hundredth circles of the zone.
18. Calculate the specific rotation, if the plane of polarization is turned through 26.4^0, traversing 20 cm the length of 20% sugar solutions.

JMJ COLLEGE FOR WOMEN, TENALI.
III B.SC., PHYSICS (w.e.f. 2011-2012)
SEMESTER V – PAPER V
ELECTRICITY & MAGNETISM

1. ELECTROSTATICS (10 Periods)

Gauss law and its applications – Uniformly charged sphere, charged cylindrical conductor and an infinite conducting Electric potential – Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

2. DIELECTRICS (5 Periods)

An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium – Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric – needle shaped cavity and disc shaped cavity.

3. CAPACITANCE (8 periods)

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser

4. ELECTRO METERS

Force between plates of condenser, construction and working of attracted disc electrometer measurement of dielectric constant and potential difference.

5. MAGNETOSTATICS (6 periods)

Magnetic shell – potential due to a magnetic shell – field due to magnetic shell – equivalent of electric circuit and magnetic shell – Magnetic induction (B) and field (H) – permeability and susceptibility – Hysteresis loop.

6. MOVING CHARGE IN ELECTRIC AND MAGNETIC FIELD (8 periods)

Hall effect, cyclotron, synchrocyclotron and synchrotron – force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot – Savart's law and calculation of B due to long straight wire, a circular loop and solenoid.

7. ELECTROMAGNETIC INDUCTION (10 periods)

Faraday's law – Lenz's law – expression for induced emf – time varying magnetic fields – Betatron – Ballistic galvanometer – theory – damping correction

8. SELF AND MUTUAL INDUCTANCE

Coefficient of coupling, calculation of self inductance of a long solenoid – toroid – energy stored in magnetic field – transformer – construction, working, energy losses and efficiency.

TEXT BOOKS

1. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath – S.Chand & Co. for semi conductor & Digital Principles.
2. Fundamentals of Physics – Halliday/ Resnick / Walker – Wiley India Edition 2007.

3. Berkeley Physics Course – Vol. II – Electricity and Magnetism – Edward M Purcell – The McGraw – Hill Companies.
4. Electricity and Magnetism – D.N. Vasudeva S. Chand & Co.

REFERENCE BOOKS

1. Electricity and Electronics – D.C. Tayal, Himalaya Publishing House.
2. Third Year Physics – Telugu Akademy
3. Unified Physics – Dr. S.L. Gupta & Sanjiv Gupta, Jayaprakash Nath and publications.

JMJ COLLEGE FOR WOMEN, TENALI.

V Semester End Examination

Sub : Physics **Paper V - Electricity and Magnetism**

Max. Marks : 70 **Time :3 Hrs.**

Part-A

I Answer the following. **2x10=20M**

1. Explain State and prove gauss's law in electronics and derive an expression for the electric field due to uniformly charged sphere ?

OR

2. Deduce Gauss law for Dielectrics. Derive the relation between them
3. Derive the expressions for the capacity of
   (a) Parallel plate capacitor with dielectric.
   (b) Spherical capacitor

OR

4. Obtain an expression for magnetic potential and intensity of magnetic field at a point on axis of a plane circular magnetic shell

Part-B

II Answer the following **2x10=20M**

5. Explain principle and working of a moving coil ballistic galvanometer. How do you apply damping correction for a B.G.

OR

6. Explain the terms self inductance and mutual inductance. Describe a method of measuring the self inductance of long solenoid.
7. Explain Hall effect twith necessary theory and derive the eqation of Hall co-efficient.

OR

8. State and explain Biot-Savart s law. Calculate the intensity of magnetic field at appoint on axis of a circular coil carrying current

Part-C

III Answer any five of the following. **5x3=15M**

9. Explain Faraday's law of electromagnetic induction.
10. What is Hall Effect?

11. Deduce the relation between D, E & P.
12. Obtain an expression for the electric potential due to electric dipole ?
13. Obtain an expression for the energy of a charged condenser.
14. Explain Magnetic shell.
15. Explain potential energy of a dipole in dielectrics.

Part-D

IV. Answer any three of the following. 3x5=15M

16. A point charge is placed at point A. the charge is 1.5×10^{-8} C. What is the radius of equi- potential surface having a potential of 30v.
17. The dielectric constant of He at 0^0c is 1.00074. Calculate its electrical susceptibility at this temperature. Take □ □ =8.85 x 10^{12}.
18. Two capacitors □ uf areconnected in parallel to a voltage source of 15 V. Calculate total amount of energy stored by two capacitors.
19. A current of 20 amp flows through each of the parallel long wires, which are 4 cm apart compute the force exerted per unit length of each wire.
20. A solenoid of length 100 cm has 1000 turns wound it. Calculate the magnetic field at the middle point of its axis when a current of 2 mp is passed through it.

JMJ COLLEGE FOR WOMEN, TENALI.
III B.SC., PHYSICS (w.e.f. 2011-2012)
SEMESTER V – PAPER VI
ATOMIC PHYSICS & SOLID STATE PHYSICS

1. **ATOMIC SPECTRA (25 periods)**

Introduction – Drawbacks of Bohr's atomic model – Sommerfield's elliptical orbits – relativistic correction (no derivation). Stern & Gerlach experiment Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules. Spectra of alkali atoms, doublet fine structure. Alkaline earth spectra, singlet and triplet fine structure. Zeeman effect, Paschen – Back effect and Stark effect (basic idea).

2. **MOLECULAR SPECTROSCOPY :**

Types of molecular spectra, pure relational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

Solid State Physics (20)

3. **CRYSTAL STRUCTURE**

Crystalline nature of matter. Crystal lattice, unit cell, Elements of symmetry. Crystal syste, Bravais lattices, Miller indices. Simple crystal structures (SC., BCC, CsCL, FCC, Nacl diamond and Zinc blends)

4. **X-RAY DIFFRACTION**

Diffraction of X-rays by crystals, Bragg's law, Experimental techniques – Laue's method and powder method.

5. **NANO MATERIALS :**

Introduction, nano particles, metal nano clusters, semiconductor nano particles, carbon clusters, carbon nano tubes, quantum nano structures – nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

6. **BONDING IN CRYSTALS :**

Types of bonding in crystals – characteristics of crystals with different bindings. Lattice energy of ionic crystals – determination of Medelung constant for NaCl crystal, calculation of Born coefficient and repulsive exponent. Born – Haber cycle.

7. **MAGNETISM**

Magnetic properties of dia, para and ferromagnetic materials. Langevin's theory of paramagnetism. Weiss' theory of ferromagnetism – concepts of magnetic domains, antiferromagnetism and ferrimagnetism ferrites and their applications.

8. **SUPER CONDUCTIVITY :**

Basic experimental facts – zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors.

Elements of BCS theory – cooper pairs. Applications. High temperature superconductors (general information)

Text Books :

1. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath – S.Chand & Co.
2. Nuclear physics by D.C. Tayal, Himalaya Publishing House.
3. III Year Physics – Telugu Academi.

REFERENCE BOOKS

1. Introduction to Solid State Physics by Charles Kittel, John Wiley & Son's
2. Nuclear Physics Irving Kaplan – Narosa Publishing House.
3. Quantum Mechanic by Mahesh C. Jani. Eastern Economy Edition.
4. Unified Physics – Dr. S.L. Gupta & Sanjiv Gupta, Jayaprakash Nath and publications

JMJ COLLEGE FOR WOMEN, TENALI.

V Semester End Examination

Sub : Physics **Paper VI (Atomic Physics & Solid State Physics)**

Max. Marks : 70 **Time : 3 Hrs.**

Part-A

I Answer the following. **1x10=10M**

1. What is Raman effect? describe an experimental setup to study Raman effect. Give the thory

OR

2 Explain the rotational-vibrational spectra.

II **Answer the following.** **1x10=10M**

3 . Describe Stern and Gerlach experiment and indicate the importence of the results obtained?

OR

4 . Explain Sommerfeld s elliptical orbit theory.Give relativistic correction for elliptical orbits.

Part-B

III Answer the following. **1x10=10M**

5. What are magnetic domains ? Explain Weiss theory of ferromagnetism ?

OR

6 What is Braggs Law ? How wavelength of X-ray can be determined using Bragg sX-ray Spectrometer ?

IV **Answer the following.** **1x10=10M**

7 Explain BCS theory of super conductors.

OR

8 Give a brief account of a) ionic and b) covalent crystals.

Part-C

V Answer any five of the following. 5x3=15M

9. Write a short note on coupling schemes.

10 Difference between dia, para & ferro magnetism.

11. Write a short note on super conductivity.

12 Show that the binding theory of deuteron is 2.23 Mev.

13. Write the structure of a diamond.

14. What are the selection rules.

15. Write short note on nano dot and nano wire.

Part-D

VI Answer any three of the following. 3x5=15M

16. Using L-S coupling, calculate the spectral terms for 4p, 4d configuration.

17. Calculate the frequency of vibration of CO molecule and spacing between its vibrational energy levels. Given that the force constant K of the bond is CO is 187n/m and the reduced mass of the CO molecule.

$\mu=1.14 \times 10^{-26}$ kg.

18. The spacing between the principle planes of NaCl crystal is $2.82A^0$. It is found that the first oder Bragg reflection occurs at an angle of 10^0. What is wavelength of X-rays.

19. An x-ray tube operated at 40kv emits a continuous x-rays spectrum with a short wave length limit $\lambda_{min}=0.310A^0$. Calculate planck's constant.

20. Calculate the limit of Balmer series of hydrogen ($R=1.097x10^7 m^{-1}$).

JMJ COLLEGE FOR WOMEN, TENALI.
III Year B.Sc., Physics Syllabus 2013-2014
PAPER-VII ELECTRICITY, MAGNETISM & ELECTRONICS
SEMESTER-VI

Unit-I **20 hrs**

1. **VARYING AND ALTERNATING CURRENTS (5 periods)**
   Growth and decay of currents in LR, CR and LCR circuits – critical damping
2. **ALTERNATING CURRENT(5 periods).**
   Relation between current and voltage in pure R, C and L –circuit, vector diagrams – power in ac circuits. LCR series and parallel resonant circuit – Q-factor. AC & DC motors
3. **MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES (10 periods)**

A review of basic laws of electricity and magnetism – displacement current – Maxwell's equations in differential form – Maxwell's wave equation, plane electromagnetic waves – Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

Unit - II

4. **BASIC ELECTRONCS (15 periods)**

Formation of electron energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation – p – n junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave rectifiers and filters, ripple factor (quantitative)

5. **TRANSISTORS AND HYBRID PARAMETERS**
   p n p and n p n transistors, current components in transistors, CB, CE and CC configurations – transistor hybrid parameters – determination of hybrid parameters from transistor characteristic
6. **Transistors As Amplifiers and Oscillators**
   Transistor as an amplifier, RC coupled amplifier, concept of negative feedback and positive feedback, Brakhausen criterion, and phase shift oscillator. (qualitative).
7. **DIGITAL PRINCIPLES (4 periods)**
   Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement method). Hexadecimal number system. Conversion from Binary to Hexadecimal – vice versa and Decimal to Hexadecimal vice versa.
8. **LOGIC GATES**: OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate, De Morgan's laws – statement and proof, Half and Full adders. Parallel adder circuits.

Text Books :

1. Fundamentals of Physics – Halliday / Resnick / Walker – Wiley India Edition 2007.
2. Berkeley Physics Course – Vol. II – Electricity and Magnetism – Edward M Purcell – The MCGraw – Hill companies.
3. Electricity and Magnetism – D.N. Vasudeva S.Chand & Co.
4. Electronic devices and circuits – Millman and Halkias. Mc. Graw – Hill education.

5. Digital Principles and Applications by A.P. Malvino and D.P. Leach. McGraw Hill Education.

REFERENCE BOOKS

1. Electricity and Electronics – D.C. Tayal, Himalaya Publishing House.
2. Third Year Physics – Telugu Akademy
3. Principles of Electronics by V.K. Mehra – S. Chand & Co.
4. Unified Physics – Dr. S.L. Gupta & Sanjiv Gupta, Jayaprakash Nath and publications.

JMJ COLLEGE FOR WOMEN, TENALI.

VI Semester

Sub : Physics **Paper VII (Electricity, Magnetsim and Electronics)**

Max. Marks : 70 **Time : 3 Hrs.**

Part-A

I Answer the following. **1x10=10M**

1. Explain the growth and decay of current in L-R circuit [inductance-resistance].

OR

2. Give the detailed theory L-C-R Series circuit carrying AC and explain condition.

II Answer the following. **1x10=10M**

3. What is pointing vector ? Derive an expression of pointing vector from Maxwell's equations.

OR

4. Derive Maxwell s equation s in differential form.With the help of it show that electro magnetic waves are transverse in nature.

Part-B

III Answer the following. **1x10=10M**

5. **D**escribe the construction and working and charactaristics of zenor diode. Explain in detail the use of Zenor diode as voltage regulator .

OR

6. Draw the circuit diagram of a full wave rectifier with L-Section filter and discuss its operation. Derive an expression for the critical inductance of this filter.

IV Answer the following. **1x10=10M**

7. Draw the hybrid equivalent circuit for common emitter circuit and derive equations for its voltage gain, current gain input and output impedance.

OR

8. State and prove Demorgan's theorems. Realize OR/NOT/AND gates using NAND gates.

Part-C

V Answer any five of the following. **5x3=15M**

9 Explain Q Factor.

10 Write the Maxwell's equations in differential form.

11 . Explain power factor in alternating Current Circuit.

12. Explain the operation of Zener diode.

13. Explain the working of a phase-shift oscillator.

14. With the help of circuit diagram explain the working of half adder and full adder.

15. Explain displacement current.

Part-D

VI Answer any three of the following. 3x5=15M

16. A condenser of a capacitance 0.5 □ F discharges. Through resistor of resistance 10Ω. Find its time constant.

17. Calculate the resonant frequency of an LCR series resonant circuit with L=30□ □ , c=0.1□ F. If the resistance of the circuit is negligible.

18. In a transistor, the base current is 0.8 mA and emitter current is 9.6mA find (a) The collector and (b) □ □ and g.□

19. What is the power factor of a circuit containing a coil of resistance 30 Ω□ □ and reactance of 30 Ω□ □ What is the phase difference between voltage and current.

20. A halfwave rectifier supplies power to a 1k Ω load. The input supply is 220 V_{rms} neglecting forward resistance of the diode. Calculate (i) V_{dc} (ii) I_{dc}.

JMJ COLLEGE FOR WOMEN, TENALI.
III Year B.Sc., Physics Syllabus 2011-2012
PAPER-VI QUANTUM MECHANICS & NUCLEAR PHYSICS)
SEMESTER-VI PAPER - VIII

Unit-II **25 hrs**

Quantum Mechanics (25)

1. INADEQUENCY OF CLASSICAL PHYSICS (discuss only)

Spectral radiation – Planck's law. Photoelectric effect – Einstien's photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of an atom – Bohr's atomic theory. Limitations of old quantum theory.

2. MATTER WAVES

De Brogile's hypothesis – wave length of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing De Brogile waves of electron in Bohr orbits.

3. UNCERTAINTY PRINCIPLE

Heisenberg's uncertainity principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Particle in a box. Complementary principle of Bohr.

4. SCHRODINGER WAVE EQUATION

Schrodinger time independent and time dependant wave equations. Wave function properties – Significance. Basic postulates of quantum mechanics. Operators, eigen function and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and portential barrier.

Unit-III

Nuclear Physics (15)

5. NUCLEAR STRUCTURE

Basic properties of nucleus – size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p and n-p scattering (concepts), nuclear forces, Nuclear models – liquid drop model, shell model.

6. ALPHA AND BETA DECAYS

Range of alpha particles, Geiger – Nuttal law, Gammow's theory of alpha decay. Geiger Nuttal law from Gammow's theory. Beta spectrum – neutrino hypothesis, Fermi's theory of –□ □ □ □ decay (qualitative).

7. NUCLEAR REACTIONS

Types of nuclear reactions, channels, nuclear reaction kinematics. Compound nucleus, direct reactions (concepts).

8. NUCLEAR DETECTORS

GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector.

Text Books :

1. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath – S.Chand & Co. for semi conductor & Digital principles).
2. Nuclear physics by D.C. Tayal, Himalaya Publishing House.
3. Third Year Physics – Telugu Akademy

REFERENCE BOOKS

1. Introduction to Solid State Physics by Charles Kittel, John Wiley & Son's.
2. Nuclear Physics Irving Kaplan – Narosa Publishing House.
3. Quantum Mechanic by Mahesh C.Jani. Eastern Economy Edition.
4. Unified Physics – Dr. S.L. Gupta & Sanjiv Gupta, Jayaprakash Nath and publications.

JMJ COLLEGE FOR WOMEN, TENALI.

VI Semester End Examination

Sub : Physics **Paper VIII Quantum Mechanics & Nuclear Physics**

Max. Marks : 70 **Time : 3 Hrs.**

Part-A

I **Answer the following.** **1x10=10M**

1. What is Compton effect ?Considering the Compton scattering derive expression for Compton shift..

OR

2 Explain uncertainty principle with one illustration.Discuss its signicance and importance.

II **Answer the following.** **1x10=10M**

3. What are matter waves? Write Davision and Germer experiment.

OR

4. What are the postulates of quantum Mechanics ? Derive an expression for the energy levels of a particle enclosed within infinite potential well ?

Part-B

III **Answer the following.** **1x10=10M**

5. Discuss in detail Gamou's theory of □ □ decay?

OR

6 Describe Geiger – Muller counter and explain its operation

IV **Answer the following.** **1x10=10M**

7 Describe the liquid drop model of the nucleus?

OR

8 What are Nuclear reactions? Write different types of nuclear reactions?

Part-C

V **Answer any five of the following.** **5x3=15M**

9. Distinguish between wave velocity and group velocity.
10. Write properties of nuclear fiorcees.
11. Deduce Shcrodinger time independent wave equation.
12. Explain Carbon-Nitrogen Cycle.
13. State and explain Deisenberg's uncertainity principle.
14 What is photoelectric effect?
15. What are limitations of Bohr's theory?

Part-D

VI **Answer any three of the following.** **3x5=15M**

16. Determine the velocity and K.E. of neutron having De-brogie wave length $1A^0$. Mass of neutron is 1.67×10^{-27} kg and $h = 6.625 \times 10^{-34}$ J-s.
17. An electron has a speed of 600 m/s with an accuracy of 0.0005%. Calculate uncertainty with which we can locate the position of the electron.

18. A particle is moving in a one-dimensional box (of finite length) of width $1A^0$. Calculate the probability of finding the particle within an interval of $1A^0$ at the center of the box. When it is in its state of least energy ?
19. A GM counter wire collects 10^8 electrons per discharge. When the counting rate is 500 counts/minute. What will be the average current in the circuit ?
20. What is threshold wave length for Nickel whose work function is 4.8 ev ?

JMJ COLLEGE FOR WOMEN(AUTONOMOUS) TENALI

DEPARTMENT OF PHYSICS

III B.Sc., PHYSICS – SKILL BASED ELECTIVE – SEMESTER V –PAPER -V

NANO AND COMMUNICATION TECHNOLOGIES

UNIT 1: Introduction: 5 *hours*

Definition – miniaturization and nanotechnology - advantages and disadvantages of nanotechnology-Applications: nano medicines, nano electronics- Implications of nanotechnology.

UNIT 2: Nano materials *5 hours*

Fullerenes and carbon forms: - Aggregated diamond nanorods - Bingel reaction – Buckypaper - Carbon nanofoam - Fullerite – Graphene – Nanoknot

UNIT 3: Carbon nanotubes: *5 hours*

Discovery - Types of carbon nanotubes - single-walled - Multi-walled – Properties of carbon nanotubes – Applications

UNIT 4: Classification Based on Structure *5 hours*

Colloid – Diamondoids –Nanoparticle – Nanoring – Nanorod – Nanoshell – Nanotube – Nanowire - Quantum dot - Quantum wire

UNIT 5: Synthesis & Characterization of Nano Materials *5 hours*

Chemical vapor deposition - Electron beam lithography - Nanoimprint lithography – Nanolithography Scanning probe microscopy - Atomic force microscope - Scanning tunneling microscope

UNIT 6: Noise: 5 hours

Concept, classification, thermal noise, shot noise, noise figure, S/N ratio Modulation-definition, need for modulation, types of modulations, AM, FM, PM-concept and definition

UNIT 7: Amplitude modulation- 5 hours

Definition, explanation with wave forms, modulation index-explanation. Power calculations, SSB concept-AM generation, AM detection

UNIT 8: Frequency Modulation 5 hours

Definition, wave forms, explanation-modulation factor- derivation of mf, AM vs FM, and definitions related to FM wave, FM generation and detection

UNIT 9: Receivers and transmitters: 5 hours

AM transmitter, AM receivers-superhet receiver, FM transmitter-pre-emphasis, de-emphasis-FM receiver, AM receiver vs FM receiver

TV transmitter- block diagram and explanation,TV receiver -block diagram and explanation.

UNIT 10: 5 hours

Radio wave propagation. Ground wave propagation. – Sky wave wave propagation- Space wave propagation.

Reference Books:

1. Study material
2. Internet
3. Applied Physics: T.Bheema Sankar & G.Prasad B.S.Publications 2009

4. Communication Technology : Kennedy
5. Basic Electronics : V K Mehatha
6. Communication Technology : Desh Pande

Question Paper Pattern :

2 Questions from each unit with internal choice (4 x 10 = 40M)
3 Short answer questions out of seven, from two units (3x5=15)
3 problems out of five selected from two units (3x5=15)

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JMJ COLLEGE FOR WOMEN(AUTONOMOUS) TENALI

DEPARTMENT OF PHYSICS

III B.Sc., PHYSICS – SKILL BASED ELECTIVE – SEMESTER VI –PAPER -VII

Lasers and Fiber optics

UNIT-I **10 hours**

LASER SYSTEMS : Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems. Laser systems: Ruby laser, Nd-YAG laser, CO_2 Laser, Dye laser, Excimer laser, Semiconductor laser.

UNIT – II: **10 hours**

LASER CAVITY MODES: Line shape function and Full Width at half maximum (FWHM) for Natural broadening, Collision broadening, Doppler broadening, Saturation behavior of broadened transitions, Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for confocal resonators. Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking.

UNIT-III **12 hours**

OPTICAL FIBER WAVE GUIDES : Basic optical laws and Self focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure. Ray optics representation, wave representation. Mode theory of circular step-index wave guides. Wave equation for step-index fibers, modes in step-index fibers and power flow in step-index fibers. Graded – index fiber structure, Graded-index numerical aperture, modes in Graded-index fibers.

UNIT-IV **13 hours**

FIBER CHARACTERISTICS : Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Lensing schemes. Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. fiber splicing techniques, fiber connectors.

TEXT BOOKS:1. Lasers -Theory and Applications – K.Thyagarajan and A.K. Ghatak. (MacMillan**)**

2. Optical fiber Communications – Gerd Keiser (Mc Graw-Hill)

REFERENCE BOOKS:

1. Introduction to fiber optics – Ajoy Ghatak and K. Thyagarajan (Cambridge)
2. Optical Electronics – Ajoy Ghatak and K.Thyagarajan (Cambridge)
3. Opto- electronics – J. Wilson and J.F.B. Hawkes (Printice Hall)

Question Paper Pattern :

1) 2 Questions from each unit with internal choice (4 x 10 = 40M)
2) 3 Short answer questions out of seven, from two units (3x5=15)
3) 3 problems out of five selected from two units (3x5=15)

JMJ COLLEGE FOR WOMEN(AUTONOMOUS) TENALI

DEPARTMENT OF PHYSICS

III B.Sc., PHYSICS – SUBJECT ELECTIVE – SEMESTER VI –PAPER -VIII

CONDENSED MATTER PHYSICS

UNIT I 6hours

Crystal Structure: Crystalline solids, periodic arrays of atoms – Fundamental types of lattices –index systems for crystal planes – Simple crystal structures (NaCl, CaCl and diamond) IonicCrystals: Electrostatic or Madelung energy – Evaluation of the madelung constant – Ionic crystalradii Reciprocal Lattice: Reciprocal Lattice – Derivation of Scattered wave amplitude – Reciprocal Lattice vectors – Diffraction conditions

UNIT 2 6hours

Crystal Diffraction: Introduction – Bragg's law – Diffraction by X-rays, electrons and neutrons – Experimental methods for Crystal structure determination – The Laue, powder and rotating crystal methods Non Crystalline Solids : Diffraction Pattern, Glasses, Amorphous Ferromagnets and Semi Conductors, Fiber Optics 6hours

UNIT 3

Defects in Crystals: Point defects:- impurities – Vacancies – Schottky and Frenkel vacancies Extrinsic vacancies – Diffusion-Color centers – F-centers , other centers in Alkali halides Line defects: -Edge dislocation – Screw dislocations – Burgers vectors – Slip – Plastic deformation – Crystal growth Planer defects:- Stacking faults – Grain boundaries – Low angle Grain boundaries 6hours

UNIT 4

Band theory of Solids: Energy spectra in atoms, molecules and solids – Bloch theorem – acceleration of the moving electron in the periodic lattice and effective mass of the electron – The tight binding approximation – Construction of Fermi surfaces – Experimental methods in Fermi surface studies: Cyclotron resonance, De Hass Von Alphen effect, Magneto resistance and the anomalous skin effect

UNIT 5 6hours

Semiconductors: Classifying Materials as Semiconductors, Chemical Bond in Semiconductors, Band Gap, Intrinsic and Extrinsic Semiconductors, Mobility Drift Velocity and Conductivity of Intrinsic Semiconductors, Carrier Concentration in Intrinsic Semiconductors, Impurity Semiconductors, Impurity States and Band Model, Energy Band Diagram and the Fermi level

UNIT 6 6hours

Magnetism: Introduction - review of basic concepts – Wiess theory of ferromagnetism – Heisenerg model and molecular field theory. Spin waves and magnons – Curie Weiss law for susceptibility. Ferri and antiferro-magnetic order. Domains and Bloch – wall energy. –

UNIT 7 6hours

Superconductivity: Occurrence of superconductivity – Effect of magnetic fields – Flux exclusion and Meissner effect – Heat capacity – Energy gap – Microwave and infrared

properties – Isotope effect – The London equations – Meissner effect and flux penetration – High frequency effects – The BCS theory – BCS ground state

UNIT 8 6hours

Nano Structures : Imaging techniques for Nano Structures, Electronic Structures of 1D System,Electrical Transport in 1D System, Electronic Structures of 0DSystem, Electrical Transport in 0DSystem.

Text and Reference Books:

1. Introduction to solid state physics by C.Kittel (8th Edition)
2. Solid state physics by R.L.Singhal
3. Solid state physics by S.L.Gupta and V.Kumar Page 10 of 19

Question Paper Pattern :

1) 2 Questions from each unit with internal choice (4 x 10 = 40M)
2) 3 Short answer questions out of seven, from two units (3x5=15)
3) 3 problems out of five selected from two units (3x5=15)

JMJ COLLEGE FOR WOMEN(AUTONOMOUS) TENALI

DEPARTMENT OF PHYSICS

III B.Sc., PHYSICS – SUBJECT ELECTIVE – SEMESTER V –PAPER -VI

NUCLEAR TECHNIQUES IN MATERIAL SCIENCE AND RADIATION PHYSICS

UNIT I **6hours**

Trace elemental analysis – X-ray fluorescence technique – particle induced x-ray emission technique – neutron activation analysis technique – experimental arrangement – applications in environmental pollution studies, medicine, geology.

UNIT 2 **6hours**

Rutherford back scattering spectroscopy – basic principle – experimental arrangement – applications in surface physics.Auger electron spectroscopy – basic principle – experimental arrangement – applications in surface physics

UNIT 3 **6hours**

Nuclear Magnetic Resonance – Nature of the phenomenon – Analysis – Experimental method – Determination of nuclear magnetic moments – structural studies.

UNIT 4 **6hours**

Positron annihilation technique – basic principle – experimental arrangement for positron life time measurement – Doppler broadening and angular correlation studies – applications .Ion beam channeling – basic principle – experimental arrangement – applications

UNIT 5 **6hours**

Units of radio activity and radiation exposure – Curie, Roentgen, Becquerel – RAD – REP-REM – Gray – Sievert - RBE, AD and DE and their relations.

UNIT6 **6hours**

Protection of personnel against nuclear radiations – Radiation monitoring – film badge technique - Radioactive waste management – planning and use of radio isotopes and chemical laboratories

UNIT 7 **5hours**

Structure of the living cell – cell division – direct and indirect action of ionizing radiation – Biological effects of radiations – somatic and genetic effects

UNIT 8 **4hours**

Applications of radio isotopes in medicine – use of ^{131}I for the study of the thyroid – use of radioisotopes in the diagnosis and treatment of cancer – radiation therapy. Applications of radio isotopes in industry – principle of industrial radiology – non destructive testing of materials

Text and Reference Books:

1. Back Scattering Spectrometry by J.W. Mayer and M.A. Nicolet. Academic Press, New York, 1978.
2. Positrons in Solids, Edited by P. Hauto jarvi, Springer – Verlag, New York, 1979.
3. Elemental X- ray analysis of materials by J.C. Russ etal, Edax Laboratories
4. Analytical Techniques for Material characterisation by W.E. Collins (Editor)
5. Solid State Physics by (R.L. Singhal)

Question Paper Pattern :

1) 2 Questions from each unit with internal choice (4 x 10 = 40M)
2) 3 Short answer questions out of seven, from two units (3x5=15)
3) 3 problems out of five selected from two units (3x5=15)