

**Assignment Topics for M.Sc. Physics (DDE) I-Year (Semester - I)**

**Course Code & Name: 34511- Classical Mechanics**

1. Define D' Alembert principle. Derive the Lagrange's equation of motion.
2. Derive Hamilton-Jacobi equation.
3. What is phase space? Explain about Liouville's theorem.
4. Derive the kinetic energy of a rigid body rotating about a fixed point.

**Course Code & Name: 34512- Mathematical Physics - I**

1. Define divergence, gradient, and curl. State and prove the Stoke's theorem.
2. Obtain the solution of Legendre's differential equation.
3. Derive the generating function and recurrence relations of Laguerre polynomial.
4. Write an elaborate note on Fourier transforms inversion theorem and convolution theorem.

**Course Code & Name: 34513- Linear and Integrated Electronics**

1. (a) Give the expression for the Fermi level energy in n – type semiconductor.  
(b) How do you define Zener diode? Why Zener Diode is used a regulator? Does Zener Diode exhibit a controlled breakdown?
2. Explain different configuration of transistors.
3. (a) Write about the construction, working and I/O characteristics of JFET.  
(b) Draw the symbol of DIAC and TRIAC  
(c) State the Barkhausen criterion for an oscillator.
4. Draw the circuit of first order low pass, high pass filter and describe it.

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## Assignment Topics for M.Sc. Physics (DDE) I-Year (Semester - II)

### **Course Code & Name: 34521-Quantum Mechanics - I**

- Q1.** Elaborately discuss the Schrodinger's time dependent and time independent equations. Describe their eigen functions and eigen vectors.
- Q2.** Elaborately describe about three dimensional harmonic oscillator and rigid rotator.
- Q3.** Find the solution of harmonic oscillator using ladder operator and matrix representation.
- Q4.** Find the solution of time dependent perturbation theory. Discuss the Rayleigh and Raman Scattering with selection rules.

### **Course Code & Name: 34522-Mathematical Physics - II**

- Q1.** State and prove Cauchy's integral formula. Obtain the solution for Laurent expansion.
- Q2.** Derive an expression for one dimensional heat equation. Find the solution of wave equation using method of separation of variables.
- Q3.** Define various types of tensors (contravariant tensor, covariant tensor, first order tensor, second order tensor, tensor of order ' $n$ ' and zeroth order tensor). State and prove Quotient law.
- Q4.** Discuss the reducible and irreducible representations. Explain the binomial distribution with suitable example.

### **Course Code & Name: 34523-Electromagnetic Theory**

- Q1.** Derive the Maxwell's equations. Explain clearly the Poynting's theorem.
- Q2.** Explain the reflection and refraction of electromagnetic waves at the interface of non-conducting media. What is Brewster law? Explain.
- Q3.** Derive an expression for Clausius-Mossotti relation. Write a note on experimental demonstration of anomalous dispersion in gases.
- Q4.** Write a note on Klystron, Magnetron and Gunn diodes. Discuss the electromagnetic fields from retarded potentials of moving point charge.

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**Assignment Topics for M.Sc. Physics (DDE) II-Year (Semester - III)**

**Course Code & Name: 34531- Molecular spectroscopy**

1. Explain the valence bond theory to explain the hydrogen molecule spectrum.
2. Calculate the rotational energy of a diatomic molecule and discuss its spectra.
3. Discuss the study of the first order stark effect for the study of the symmetric top molecule.
4. Discuss the Raman spectrum of symmetric top molecules.

**Course Code & Name: 34532- Quantum Mechanics - II**

1. Write a note on addition of angular momenta. Obtain the values of C.G coefficients for  $j_1 = 1/2$  and  $j_2 = 1/2$  system.
2. What do you mean by central field approximation? Discuss the Hartree –Fock method of central field approximation.
3. Solve the Dirac equation for free particles and explain the salient features of the energy spectrum.
4. Discuss the general theory of partial wave analysis in scattering.

**Course Code & Name: 34533- Microprocessor and Electronic Instrumentation**

1. Write in detail the architecture of 8086 with neat pin diagram, pin function and the mode of operation.
2. Elaborately explain the architecture of 8 bit microcontroller 8051 with its features, signal description and addressing modes.
3. Sketch out the details of programmable peripheral interface device (8255) including the pin diagram, pin function, addressing modes, etc.
4. Explain the operation of photovoltaic cell and photoconductive cell with neat diagram.

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**Assignment Topics for M.Sc. Physics (DDE) II-Year (Semester - IV)**

**Course Code & Name: 34541-Condensed Matter Physics**

- Q1.** Discuss the crystal lattice, crystal structure and symmetry elements. Write a note on Bravais lattice and crystal systems.
- Q2.** Explain the Kronig-Penny model. Describe the piezo-, pyro- and ferro-electric properties of crystals.
- Q3.** Elaborate the Langevin's theory of paramagnetism. Discuss the Weiss molecular field theory.
- Q4.** Write a note on Meissner effect, Isotope effect and Josephson effect.

**Course Code & Name: 34542-Nuclear and Particle Physics**

- Q1.** Explain the Fermi's theory of beta decay. Discuss the Bohr Wheeler theory.
- Q2.** Write a note on nuclear fission, nuclear fusion and nuclear reactions. Describe the Yukawa's meson theory of nuclear forces.
- Q3.** Discuss the interaction of neutrons with matter.
- Q4.** Obtain the Gell-Mann-Nishijima formula. Discuss about the application of symmetry arguments to particle relation.

**Course Code & Name: 34543-Materials Science**

- Q1.** What is polymer? Mention its structure and properties. What are the types of polymers? Discuss the application of polymers.
- Q2.** Write a note on vacuum pumps. How to deposit thin films by thermal evaporation technique? Explain.
- Q3.** Discuss about the Ruby laser, GaAs/AlGaAs semiconductor laser, and He-Ne laser.
- Q4.** Write a note on cement-matrix composite and metal-matrix composite materials. Explain the fabrication of piezoelectric MEMS material.

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