

## DECEMBER 2024 ASSIGNMENT QUESTIONS

### M.SC. PHYSICS

#### SEMESTER I

#### NAME OF THE COURSE : MATHEMATICAL PHYSICS (SPHM11)

1. a) Proof orthogonal transformation theorem  
(OR)  
b) State and De moivre's Theorem
2. a) Write an detailed note on types and properties of matrices  
(OR)  
b) Describe the application of fourier transformation in vibration of infinite string.

#### NAME OF THE COURSE : CLASSICAL MECHANICS AND RELATIVITY (SPHM12)

1. a) Describe the mechanics of a single particle using conservation law  
(OR)  
b) Derive lagrangian equation of motion
2. a) Derive one dimensional single harmonic oscillator and motion of particle in a central force field.  
(OR)  
b) Derive Einstein's mass –energy relation.

#### SPHM13

#### NAME OF THE COURSE : LINEAR AND DIGITAL IC'S AND APPLICATIONS

1. a) Write an detailed note on operational – amplifier along with its characteristics  
(OR)  
b) Brief about the Linear applications of op -AMP
2. a) Give an detailed note on Active filters.  
(OR)  
b) How will you construct an Voltage regulator using op –AMP

#### SPHE11

#### NAME OF THE COURSE : ENERGY PHYSICS

1. a) Write short note on conventional and non –conventional energy sources  
(OR)  
b) What are the basic principle of ocean thermal energy conversion systems.
2. a) How wind energy conversions works? Elaborate on its advantages and disadvantages.  
(OR)  
b) Give an introduction on Bio-gas generation and its basic process.

## **SEMESTER II**

### **NAME OF THE COURSE : STATISTICAL MECHANICS ( SPHM21)**

1. a) Explain Landau's theory of phase transition.  
(OR)  
b) Elaborate on the connection between statistics and Thermodynamics.
2. a) State and explain 'Fermi Dirac statistics'.  
(OR)  
b) Derive Fokker –Planck equation.

### **NAME OF THE COURSE : QUANTUM MECHANICS -I (SPHM22)**

1. a) Basic formulation of Time –dependent and Time –independent Schrodinger's equation.  
(OR)  
b) Brief particle moving in a spherically symmetric potential.
2. a) Write short notes on Schrodinger representation and Heisenberg representation.  
(OR)  
b) Discuss Time independent perturbation theory for non-degenerate energy levels..

### **NAME OF THE COURSE : ADVANCED OPTICS (SPHE21)**

1. a) Explain about the classifications in polarization  
(OR)  
b) Write short notes on basic principles of LASERS.
2. a) Define Fibre optics. How total internal reflection principle works in a fibre optic cable.  
(OR)  
b) Elaborate on Cotton – Mouton effect and Kerr magneto –optic effect.

### **NAME OF THE COURSE : SEWAGE AND WASTE WATER TREATMENT AND REUSE (SPHE22)**

1. a) What are the methods of waste water recovery? Brief three such methods.  
(OR)  
b) What are the Disinfection methods used in waste water recovery? Brief UV-radiation & Chlorination.
2. a) Briefly discuss the theory of chemical disinfection.  
(OR)  
b) Discuss the physical disinfection methods UV radiation & Solar disinfection.

**NAME OF THE COURSE : PHYSICS FOR COMPETITIVE EXAMINATIONS (SPHS21)**

1. a) State and explain Kepler's laws.

(OR)

b) Write a brief note on Stefan –Boltzmann law.

2. a) Explain Young's double slit interference and single slit diffraction.

(OR)

b) Explain Gauss law and its applications.

### **SEMESTER III**

#### **NAME OF THE COURSE : QUANTUM MECHANICS-II (SPHS21)**

1. a) Discuss an brief note on Born approximation and its validity.  
(OR)  
b) Explain the theory behind Time dependent perturbation Theory.
2. a) Derive Klein –Gordon Equation  
(OR)  
b) Explain Feynman's Theory of positron.

#### **NAME OF THE COURSE : CONDENSED MATTER PHYSICS (SPHM32)**

1. a) Explain the Reciprocal lattice of SC, BCC and FCC.  
(OR)  
b) Explain Debye's Theory of lattice heat capacity.
2. a) State and prove Bloch Theorem.  
(OR)  
b) Explain the Heisenberg's interpretation of Weiss field

#### **NAME OF THE COURSE : NUMERICAL METHODS AND PROGRAMMING IN C++ (SPHM33)**

1. a) Explain convergence of solutions in Bisection and Newton –Raphson methods  
(OR)  
b) How do you determine the eigen value and eigen vectors of matrices.
2. a) Derive Newton's forward and backward interpolation  
(OR)  
b) Explain Euler and Runge Kutta methods in detail.

#### **NAME OF THE COURSE : SPECTROSCOPY (SPHE31)**

1. a) Explain the rotation spectra of diatomic molecules using Rigid rotor.  
(OR)  
b) Brief about vibrations of simple harmonic oscillator
2. a) Explain the theory of Raman Scattering.  
(OR)  
b) Explain the basic principle of Electron spin Resonance.

**NAME OF THE COURSE : MICROPROCESSOR 8085 & MICROCONTROLLER 8051**

**(SPHS31)**

1. a) Discuss an brief note on Instruction Set Adressing modes and programming techniques in 8085.

(OR)

b) Explain the interfacing of digital to analog and analog to digital converter of 8085

2. a) Explain about the 8051 microcontroller hardware.

(OR)

b) Explain Data moving (Transfer) instructions in 8051.