

## **IMPORTANT QUESTIONS**

### **MODULE-1**

#### **4 Marks**

1. Define Grad, Div and Curl and explain their physical significance
2. Explain Gauss-Divergence theorem and its significance
3. Explain Stoke's theorem and its significance
4. Explain Electric field and Electric potential due to point charge distribution
5. Explain Electric field and Electric potential due to line charge distribution
6. Explain Electric field and Electric potential due to surface charge distribution
7. Explain Electric field and Electric potential due to volume charge distribution
8. Using Gauss' law, find the electric field intensity due to line charge of infinite length
9. Derive the expression of Poisson's equation for electrostatic potential
10. Derive expression of Laplace equation for electrostatic potential
11. Derive the expression  $J_1 = \sigma E$
12. Derive the expression  $J_2 = \frac{\partial D}{\partial t}$
13. Derive continuity equation
14. State and explain Gauss's law
15. State and explain Biot-Savart law
16. State and explain Faraday's law
17. State and explain Ampere circuital law
18. Derive relationship between polarizability, permittivity and dielectric constant
19. Distinguish between polar and non-polar dielectrics

### **8 Marks**

1. Apply Gauss' law to find the electric field intensity inside and outside a uniformly charged spherical shell
2. Obtain Maxwell's equation for electromagnetism from fundamental laws of electricity and magnetism
3. Explain the various polarization mechanisms in dielectric
4. Describe the frequency and temperature dependence on polarization of dielectrics
5. Derive an expression for the internal field in a dielectric
6. Derive Clausius-Mossotti equation

### **MODULE-2**

### **4 Marks**

1. Compare Soft and Hard magnetic materials
2. Explain Hysteresis loop and energy product with diagram
3. Explain the concept of ferromagnetism
4. Write a note on Giant Magneto Resistance (GMR) with neat diagram
5. Write a note on Colossal Magneto Resistance (CMR) with neat diagram
6. Write a note on Garnets and its applications
7. What are Magnetoplumbites and give its applications
8. What are Multiferroic materials and explain its applications

### **8 Marks**

1. Explain in detail about the theory of magnetic domain in ferromagnetic materials with neat diagram
2. What are ferrites? Describe the regular and inverse Spinel structure of ferrites with neat diagram. Write their applications

3. What is magnetic bubble memory? Explain the principle and working of MBM and write their uses
4. Explain the properties, magnetic mechanism and processing of magnetic thin films.
5. Explain the function of Tunnel Magneto-resistance with neat sketch

### **MODULE-3**

#### **4 Marks**

1. Write a note on inadequacies of classical mechanics
2. Explain photoelectric effect with neat diagram
3. Explain Compton effect with necessary diagram
4. What is blackbody radiation and explain Planck's theory of blackbody radiation?
5. Derive de-Broglie equation in terms of Energy/Voltage/Temperature
6. Heisenberg's uncertainty principle
7. Physical significance of the wave function
8. Normalization of wave function
9. Describe Davisson and Germer's diffraction experiment for the verification of matter waves or diffraction

#### **8 Marks**

1. Derive Schrödinger time independent equation
2. Derive Schrodinger time dependent equation
3. Application of Schrodinger equation for a particle in box (12)

4. Linear Harmonic Oscillator- Energy and Wave function (12)
5. Hydrogen atom problem – radial, angular equation derivation and its solutions

#### **MODULE-4**

#### **4 Marks**

1. What is meant by diffraction of light?
2. Distinguish between interference and diffraction
3. Distinguish between Fresnel and Fraunhofer diffraction
4. Dispersive power of a plane diffraction grating
5. Resolving power of a plane diffraction grating
6. What is meant by plane polarized, circularly polarized and elliptical polarized light?
7. Distinguish between unpolarized and polarized light
8. How will you obtain plane polarized light by reflection?
9. Explain the terms plane of polarization and plane of vibration
10. Explain the phenomena of double refraction in a calcite crystal
11. Explain Brewster's law
12. State and explain law of Malus
13. Explain circular polarization
14. Explain elliptical polarization
15. Write a note on Quarter wave plate
16. Write a note on Half wave plate
17. State the laws of rotatory polarization

## **8 Marks**

1. Derive an expression for the intensity distribution due to Fraunhofer diffraction at a single slit.
2. Describe the Fraunhofer diffraction due to double slit
3. Give the construction and theory of plane transmission grating and explain the formation of spectra by it
4. Give the theory of plane transmission grating and show how would you use it to determine the wavelength of light
5. What do you understand by the resolving power of a grating? Derive the necessary expression
6. How will you produce and detect plane, elliptically and circularly polarized light?
7. Show that the plane polarized and circularly polarized lights are the special cases of elliptically polarized light
8. Describe the construction of a Nicol prism and show how it can be used as a polarizer and as an analyzer.
9. Give the construction and theory of (i) quarter wave plate (ii) half-wave plate.
10. Give three methods for producing plane polarized light
11. Explain Brewster law and show that when light is incident on a transparent substance at the polarizing angle, the reflected and refracted rays are at right angles
12. State and explain Fresnel's relation at a dielectric interface

## **MODULE-5**

### **4 Marks**

1. Characteristics of LASER
2. Explain Absorption and Emission process
3. Explain different pumping mechanisms
4. Essential components of a laser system
5. Distinguish between Step index and Graded index fiber
6. Distinguish between single mode and multimode fiber
7. Pressure sensor (intrinsic)
8. Position sensor (extrinsic)

### **8 Marks**

1. Derivation of Einstein's co-efficient (8)
2. Carbon-di-oxide laser (3+5)
3. Nd:YAG Laser (2+6)
4. Semi-Conductor (Homo-junction) LASER (2+6)
5. Semi-Conductor (Hetero-junction) LASER (2+6)
6. Derivation of Numerical Aperture and acceptance angle or propagation characteristics of light through optical fiber (2+6)
7. Explain different types of fiber based on materials, no. of modes and refractive index profile (4+4+4)
8. Explain different kind of losses associated with optical fibers – Attenuation and dispersion
9. Fiber optic communication system
10. Intrinsic and extrinsic sensor