## I B.TECH - II SEM Question Bank (2018-19)

**Subject Name: APPLIED. PHYSICS** **Branch: EEE**

# UNIT-1

1. a) State and explain the Principle of superposition of waves.- 4M
   b) Explain the formation of Newton's rings and obtain an expression for the diameter of the dark rings in reflected system..– 6M
2. a) In Newton's rings experiment, diameter of the tenth dark ring due to wavelength 6000Å in air is 0.5 cm. Find the radius of curvature of the lens.– 4 M
   b) If the air film in the Newton's rings apparatus is replaced by an oil film, then how does the radius of the rings change? Explain. – 6M
3. a) What are the necessary conditions to get clear and distinct interference fringes – 4M
   b) Describe principle ,construction and working of Michelson Interferometer. - 6M
4. a) Explain the colours in a thin film when exposed it to a sun light – 4M
   b) Explain why the centre of Newton's rings is dark in the reflected system. Why are they circular? 6M
5. a) Distinguish between Monochromatic and Polychromatic light sources, Give one example for each
   b) With a ray of diagram, discuss the theory of thin films and the condition constructive and destructive interference in the case of reflected light.—7M
6. a) Describe principle ,construction and working of Febry-Perot Interferometer. - 6M
   b) In Newton's rings experiment, diameter of $10^{th}$ dark ring due to wavelength 6000 A in air is 0.5 cm. Find the radius of curvature of lense.



# UNIT—II

1. a) What are the types of diffraction and give the difference between them ? 4 M
   b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima - 6 M
2. a) What is the difference between interference and diffraction –4M
   b) Explain the diffraction due to two parallel slits and obtain the Intensity of light on the screen.—6M
3. a) Define the grating and Explain with necessary theory, the Fraunhofer diffraction due to 'N'parallel slits.– 6 M

b) Calculate the maximum number of order possible for a transmission grating – 4 M

4. a) What happens to the diffraction fringes, if the slit width is reduced in single slit experiment? Explain why?.- 6 M

   b) A grating has 6000 lines/cm.Find the angular separation between two wavelengths of 500 nm and 510 nm in 3rd order – 4M

5. a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory ? 4 M

   b) Explain the theory of plane transmission grating abd derive equations for maxima and minima.- 6M

6. a) Define resolving power of grating and explain Rayliegh criterion for resolution and determine the resolving power of the Telescope - 6 M

   b) How many orders will be visible ,if wave length of light is 5000 A ? Given that the number of lines per centimeter on the grating is 6655. - 4 M

## UNIT – III

1. a) What is a half wave plate and Quarter wave plate? Deduce an expression for its thickness-6 M

   b) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. Here μe= 1.553 and μo= 1.544. - 4 M

2. a) Distinguish between polarized and un polarized lights –3M

   b) State and explain Brewster's law? Discuss how the plane, Circular and Elliptical

3. a) Write a note on double refraction? 4M

   b) Explain the principle, construction and working of a Nicol prism.-6M

4. a) Write the difference between Spontaneous and Stimulated Emissions.– 4M

   b) Explain the working of Ruby laser with the help of neat energy level diagram..– 6M

5. a) What is population inversion and how can it be achieved ?.- 4 M

   b) Explain the working of He-Ne gas laser with the help of neat energy level diagram.- 6 M

6. a) Explain Einstein's coefficients. Derive the relation between them.-5M

   b) What are the characteristics and applications of LASER beam.-5M

## UNIT – IV

1. a) What is an electrical potential. Derive the electrical potential in an non-uniform electric field - 6M

   b) Write the Maxwell's electromagnetic equations in differential or integral form.– 4M

2. a) State and explain stokes and Gauss divergence theorems – 4 M

   b) Derive velocity of electromagnetic wave in a dielectric medium.– 6M

3. a) State and prove Gauss's divergence theorem and explain its importance.- 6 M

   b) What is divergence? Show that divergence of a vector field is a scalar ?– 4 M

4. a) What is a gradient? Show that gradient of a scalar is a vector- 4 M

   b) State and prove stokes theorem? Explain its importance -6 M

5. a) Define scalar field? Explain with examples - 3 M

   b) Derive wave equation for an electric field in dielectric medium.- 7 M

6. a) Define vector field? Explain with examples - 3 M

   b) Derive wave equation for a magnetic field in dielectric medium.- 7 M



## UNIT—V

1. a) Derive time independent wave equation for a free particle – 5 M

   b) Derive time dependent Schrodinger's wave equation for a free particle.– 5M

2. a) Derive Eigen values and Eigen functions for a particle in a one dimensional potential box.-7 M

   b) Calculate the minimum energy of free electron trapped in a one dimensional box of width 0.3 nm (given h = 6.63 X $10^{-34}$ J. S and $m_e$ = 9.1 X $10^{-31}$ Kg).– 3M

3. a) What is Fermi level and explain the Fermi-Dirac distribution function of electron in ametal. .- 4 M

   b) Discuss the variation with temperature on the Fermi-Dirac distribution - 6 M

4. a) What are the properties of Matter waves?.- 4 M

   b) Distinguish between Lorentz-Drude theory and Sommerfeld theory of metals – 6 M

5. a) What is the most probable position for a particle in 1D potential box of width L in the first quantum state, explain graphically. How matter waves are different from Electromagnetic waves?.- 7 M

b) If E is the ground state of the particle confined to move in a 3D potential box, what would be the increase in the energy from second energy to next higher energy level– 3M

6. a) Based on Sommerfeld quantum free electron theory, derive an expression for electrical conductivity in metals.- 6 M

   b) Explain the salient features draw backs of Classical free electron theory.. - 4 M

## UNIT- VI

1. a) What is Bloch theorem. Explain.- 3 M

   b) Explain the Kronig-penny model of solids and show that it leads to energy band structure.- 7 M

2. a) Explain the concept of effective mass of an electron..- 3 M

   b) What do you understand by drift and diffusion currents in the case of a semiconductor? Deduce Einstein's relation relating to these currents..– 7 M

3. a) Explain P- type extrinsic semiconductors.- 4 M

   b) Derive an expression for Fermi energy in extrinsic P-type semiconductor - 6 M

4. a) State and explain Hall Effect – 5 M

   b) Derive an expression for Hall coefficient and Give any two of its applications..- 5M

5. a) Distinguish between Intrinsic and Extrinsic semiconductors - 2M

   b) Derive the expression for concentration carriers in intrinsic semiconductor.– 8M

6. a) Distinguish between N- type and P- type extrinsic semiconductors – 4 M

   b) Derive the expression for Fermi energy in N-type extrinsic semiconductor..– 6M