BE-201

MODEL QUESTION PAPER - I

ENGINEERING PHYSICS

Time: 3 Hours
MM: 70

Note: 1. Attempt all questions. Assume suitable data wherever necessary.

Unit-I

1. Explain the construction and working of Ruby or He-Ne laser. (14)

OR

(a) What is meant by acceptance angle of an optical fiber? Show that it does not depend on the physical dimensions of the fiber. (10)

(b) A step index fiber is made with a core of index of 0.0007. It is operated at a wavelength of 1.3 μm. Find the fiber V-number and the modes the fiber will support. (4)

Unit-II

2 (a) What is grating element of a plane transmission grating? Discuss the role of grating element in the function of the grating. (10)

(b) A parallel beam of monochromatic light is allowed to be incident normally on a plane grating having 1250 lines per cm and a second order spectral line is observed to be deviated through 30°. Calculate the wavelength of incident light. (4)

OR

(a) How nicol prism can be used as polarizer and analyzer? Explain in detail with the help of diagram. (10)

(b) The polarizing angle of the piece of glass for green light is 60°. What is the angle of minimum deviation for a 60° prism made of same glass. (4)

Unit-III
3 (a) Explain the working of Geiger-Muller counter. What do you understand by paralysis
time or dead time? (10)

(b) A GM counter with dead time \( \tau = 200 \mu s \) is used to detect radiation from radioactive
source:

If observed count rate is 1000 s\(^{-1}\) what is the true count rate? (4)

OR

Write construction and working of Cyclotron. Find the resonance condition and
maximum energy gained by accelerating particle in cyclotron. (14)

Unit-IV

4. (a) Explain De-Broglie hypothesis of matter waves? (10)

(b) Calculate de-Broglie wavelength associated with a proton moving with a velocity
equal to \( 1/20^{th} \) of the velocity of light. Given proton mass = \( 1.67 \times 10^{-27} \) Kg, \( h = 6.62 \times 10^{-34} \) joule-sec. (4)

OR

(a) Find Eigen value and eigen function for a particle in an infinite deep potential well.
(10)

(b) An electron is bounded in one-dimensional infinite well of with width 20 Å. Find the
difference to energy values of first excited and second excited states in electron volts. (4)

Unit-V

5. Explain the Hall effect in a conductor. Describe an experiment to determine the Hall
coefficient of a conducting material. (14)

OR

(a) Explain Fermi energy function. How does it vary with temperature (7)

(b) Explain construction and discuss I-V characteristics of the following semiconductor
devices: (7)

(i) Photodiode
(ii) Solar cell
BE- 201

MODEL QUESTION PAPER - II

ENGINEERING PHYSICS

Time: 3 Hours

Note: 1. Attempt all questions. Each question carries equal marks.

Unit-I

1. (a) Explain Einstein’s A and B coefficient. Also derive the relation between them. (7)

(b) Define the terms Population inversion and Resonance cavity (7)

OR

(a) What are Step Index Fibre and Graded Index Fibre? How light propagates through step index and graded index fibre? Explain how pulse dispersion is minimized in graded index fibre. (10)

(b) Calculate the numerical aperture (N.A.) and maximum acceptance angle of an optical fibre from the following data: (4)

\[ \mu_1 = 1.55 \text{ and } \mu_2 = 1.50 \]

Unit-II

2. Explain the formation of Newton’s ring. Proof that the diameter of dark ring is proportional to square root of natural numbers and the diameter of bright ring is proportional to square root of odd natural numbers. (14)

OR

(a) Explain Brewster’s law and with the help of this law demonstrate that when light is incident on the transparent substrate at the polarizing angle, the reflected and refracted rays are at right angle. (10)

(b) In a Newton’s Ring experiment the diameter of 5th ring was 0.336 cm and the diameter of 15th ring was 0.590 cm. If the radius of curvature of the plano-convex lens is 100 cm, calculate wavelength of light used. (4)
Unit-III

3. (a) Explain liquid drop model of atomic nucleus. (7)

(b) State clearly what do you understand by terms mass defect and binding energy with respect of the nucleus? (7)

OR

(a) Explain the construction, principle and working of Betatron (10)

(b) In certain betatron, the maximum magnetic field at the electron orbit is 0.5 Wb/m². The diameter of stable orbit is 1.5 m. if frequency of A.C. current through electromagnet coil is 50 Hz. Calculate for electron final energy in MeV and Average energy gained per revolutions. (4)

Unit-IV

4. What is Compton Effect? Derive the expression for Compton shift. Discuss the various possibilities of the X-ray scattering. Indicate how it strengthens the quantum concept of light? (14)

OR

(a) State and prove time independent and dependent Schrödinger wave equation. (7)

(b) State and explain Heisenberg’s uncertainty principle (7)

Unit-V

5. Explain quantitatively band theory of solids. Explain energy band diagram and distinguish metal, semiconductor and insulator on the basis of above theory (14)

OR

(a) What do you understand by super conductor? Explain Type – I and Type-II superconductors. (7)

(b) Briefly describe the qualitative analysis of Kroning Penney Model. (7)