

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I MECHANICAL :SUMMER- 2022
SUBJECT : WAVES & SOLID STATE PHYSICS

Day : Tuesday
Date : 19-07-2022

S-24058-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

Constants:

$$e = 1.6 \times 10^{-19} \text{C}$$

$$m_e = 9.1 \times 10^{-31} \text{kg}$$

$$h = 6.63 \times 10^{-34} \text{J-s}$$

$$m_p = 1.67 \times 10^{-27} \text{kg}$$

$$N_a = 6.025 \times 10^{23} \text{atoms/gm - mole}$$

- Q.1 a)** Obtain an expression for path difference in interference due to thin film of non-uniform thickness. Write the conditions for constructive and destructive interference. **[06]**
- b)** Distinguish between positive and negative crystals. **[04]**

OR

- Q.1** Distinguish between Fraunhofer and Fresnel diffraction. Calculate the angle of diffraction in first order, if a light of wavelength 4×10^{-5} cm incident normally on the plane transmission grating of width 4cm having 15000 lines. **[10]**

- Q.2 a)** With neat and labeled diagram explain construction and working of He-Ne laser. **[06]**
- b)** Discuss unique properties of laser. **[04]**

OR

- Q.2** Discuss Einstein coefficients and construction and working of Ruby laser. **[10]**

- Q.3 a)** Discuss the Hall effect and obtain an expression for Hall voltage and Hall coefficient. **[06]**
- b)** The resistivity of n-type semiconductor is $10^{-5} \Omega \text{ cm}$. Calculate the number of donor atoms to be added to obtain the resistivity. Given $\mu_e = 999 \text{ cm}^2 / \text{V-sec}$. **[04]**

OR

- Q.3** Explain band structure of p-n junction diode under forward and reverse biasing. Draw band diagrams. **[10]**

- Q.4 a)** Discuss the synthesis of nanoparticles by chemical method. Explain the growth of nanoparticles by Lamer diagram. **[06]**
- b)** Write a note on quantum dots. **[04]**

OR

- Q.4** Discuss the two approaches of nanofabrication. Explain the synthesis of nanoparticles by physical method. **[10]**

- Q.5 a)** With neat labeled diagram explain construction and working of transmission electron microscope. **[06]**
- b)** An electron starts from rest and moves freely in an electric field $E = 20 \text{ kV/m}$. Determine : **i)** force on the electron **ii)** its acceleration **[04]**

OR

- Q.5** With neat and labeled diagram explain various parts and working of scanning electron microscope. **[10]**

- Q.6 a)** Discuss the unique properties; pseudo-elasticity and shape memory effect of shape memory alloys. **[06]**
- b)** Write a note on smart polymers. **[04]**

OR

- Q.6** Discuss Meissner effect and write a note on Type – I and Type – II superconductors. **[10]**