Paper / Subject Code: 58605 / Applied Physics - I.

F.E. SEM I / CHOICE BASE / NOV 2018 / 24.12.2018

[Max. Marks= 60]

(2 Hours)

N.B: **1) Question number 1 is Compulsory.**
2) Attempt **any three** questions from Q.2 to Q.6.
3) Assume suitable data wherever required.
4) Figures to the right indicate full marks.

Q.1. Attempt **any** Five questions from the following. (15)

(a) Draw (123), (321), ($\bar{1}$02).
(b) Explain with diagram HCP unit cell based on lattice parameters.
(c) State properties of matter waves.
(d) Calculate electron & hole concentration in intrinsic Si at room temperature if its electrical conductivity is $4x10^{-4}$ mho/m. Given that mobility of electron = $0.14m^2$/V-sec and mobility of holes=0.04 m^2/V-sec.
(e) Explain Meissner Effect with the help of diagram.
(f) A conference room has a total volume of $2000m^3$. The magnitude of total absorption within the conference room is 100 sabin. Calculate the reverberation time.
(g) Discuss any three applications of Ultrasonic waves.

Q.2. **(a)** State Heisenberg's Uncertainty Principle. Show that electron doesn't exist in the nucleus. Find the accuracy in the position of an electron moving with speed 350 m/sec with uncertainty of 0.01%. (8)
(b) Show that for intrinsic semiconductors the Fermi level lies midway between the conduction band and the valence band. With the help of diagram explain effect of impurity concentration on Fermi level of N type semiconductor. (7)

Q.3. **(a)** Derive Bragg's condition for X-ray diffraction. Monochromatic X rays are incident on a crystal. If first order reflection is observed at an angle 3.4°, at what angle would second order reflection be expected. (8)
(b) Derive an expression for Hall voltage and Hall coefficient with neat labelled diagram. (7)

Q.4. **(a)** Differentiate between Type-I & Type-II Superconductors. (5)
(b) Discuss in details any three factors affecting acoustics of a hall with their remedies. (5)
(c) A quartz crystal of thickness 1mm is vibrating at resonance. Calculate its fundamental frequency. (Assume that for quartz, $Y=7.9x10^{10}N/m^2$ and ρ =2.650gm/cc.) (5)

Q.5. **(a)** Define Ligancy. Find the value of critical radius ration for Ligancy 3. (5)
(b) For an electron passing through potential difference 'V', show that its wavelength is; (5)

$$\lambda = \frac{12.26}{\sqrt{V}} A°$$

(c) What is the probability of an electron being thermally excited to conduction band in Si at 27°C. The band gap energy is 1.12 eV. (5)

Q.6. **(a)** Explain Point defects in crystals. (5)
(b) Show that group velocity of matter waves associated with a particle is equal to the particle velocity (**V**group=**V**particle). (5)
(c) Explain the principle, construction and working of Light Emitting Diode. (5)

****

53917

307EF761CE1F3E0AB132F19C10027F40