

UNIVERSITY OF PUNE
[4361]-102

F. E. (Semester - II) Examination 2013
Engineering Physics
(2012 Pattern)

[Time : 2 Hours]

[Max. Marks:50]

Instructions :

- 1) Answer all the questions.
- 2) Black figures to the right indicate full marks.
- 3) Neat Diagram must be drawn wherever necessary.
- 4) Electronic Pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Constants : $h = 6.63 \times 10^{-34} \text{J-s}$
 $m_e = 9.31 \times 10^{-31} \text{kg}$
 $e = 1.6 \times 10^{-19} \text{C}$
 $c = 3 \times 10^8 \text{m/s}$

- Q.1 a) Explain the formation Newton's ring with diagram and drive the diameter of bright ring. [06]
- b) Discuss the use of ultrasonics for flaw Detection [03]
- c) A auditorium of volume 5500m^3 is found to have reverberation time 2.5 secs. The sound absorbing surface of the auditorium has an area of 750m^2 . Calculate the average absorption coefficient of the auditorium. [03]

OR

- Q.2 a) Define magnetostriction effect. Explain how magnetostriction oscillator is used to produce ultrasonic waves with the help of neat circuit diagram. [06]
- b) Explain with diagram how interference Principle is used to design anti reflection coating. [03]
- c) Monochromatic light from He-Ne laser source ($\lambda = 6328 \text{Å}$) is incident normally on a diffraction grating having 6000 lines/cm. Find the angle at which one would observe second order maximum. [03]
- Q.3a) Define Double refraction. Explain Huygen's Theory of Double refracting crystal with diagram. [06]
- b) Define Fermi level. Plot the variation of Fermi level with the increase of temperature for n-type and p-type semiconductor. [03]

- c) Calculate the conductivity of Ge sample if the donor impurity is added to an extent of one part in 10^8 Ge atoms at room temperature. [03]
(Data Given : $N_a=6.023 \times 10^{23}$ atoms/gm-mole. At. Wt. of Ge=72.6
Density of Ge=5.32gm/cc. , $\mu=3800 \text{ cm}^2/\text{v-s.}$)

OR

- Q.4a) Define Hall effect. Derive the expression of Hall coefficient, Hall Voltage and discuss their applications. [06]
b) Explain the process of recording Hologram with the help of LASER. [03]
c) At what angle of incidence should a beam of sodium light be directed upon the surface of diamond crystal to produce complete polarized light (Data Given: Critical angle for diamond= 24.5°). [03]
- Q.5a) Derive Schrodinger time independent wave equation. [06]
b) Define phase velocity, Group velocity and Derive their expressions. [04]
c) Calculate the De-Broglie wavelength associated with 1 Mev proton($m_p=1.67 \times 10^{-27}$ kg). [03]

OR

- Q.6a) Explain Heisenberg Uncertainty Principle and prove this principle using single slit Diffraction experiment. [06]
b) Calculate the energy and momentum of an electron confined in a rigid box of width $2A^0$ for lowest energy state. [04]
c) Does the matter waves are electromagnetic waves? Explain. [03]
- Q.7 a) Explain the synthesis of nanoparticles through colloidal route with diagram . [06]
b) Differentiate between Type-I and Type –II Superconductor with diagram [04]
c) Explain two applications of Superconductivity. [03]

OR

- Q.8 a) Explain Meissner effect and Critical magnetic field for superconductivity. [06]
b) Explain the optical and electrical properties of nanoparticles. [04]
c) Explain the applications of nanoparticles in medical and electronic industry. [03]