

Total No. of Questions : 8]

SEAT No. :

P4418

[Total No. of Pages : 3

[5251]-1002

F.E. First Year (Engineering) (II Semester)

ENGINEERING PHYSICS

(2015 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Neat diagram must be drawn wherever necessary.
- 2) Figure to the right indicate full marks.
- 3) Use of logarithmic table, slide rule, mollier charts, Electronics Calculator, and steam table is allowed.
- 4) Assume suitable data, if necessary.

- Q1) a) Explain the theory of formation of Newton's Rings? Hence, explain how the refractive index of liquid can be determined. [6]
- b) How many lines per cm are there on the surface of a plane transmission grating which gives 1st order of light of wavelength 6000Å at an angle of diffraction 30°. [3]
- c) List any three applications of ultrasonics. Explain any one of them in brief. [3]

OR

- Q2) a) What is reverberation? Give Sabine's formula for reberberation time. What are the factors affecting reberberation time? Explain how it can be optimized by controlling these factors. [6]
- b) Calculate the length of an iron rod which can be used to produce ultrasonic waves of frequency 20 kHz Given, Young's modulus of iron 1.16×10^{11} N/m². Density of iron = 7.23×10^3 kg/m³ [3]
- c) The resultant amplitude of a wave when monochromatic light is diffracted from a single slit $E_0 = E_m (\sin \alpha)/\alpha$, specify the terms involved and derive condition of minima. [3]

P.T.O.

- Q3) a)** What are retardation plates? Give their types? Derive the expression for thickness for any one of them. [6]
- b)** Define the following: [3]
- Stimulated emission
 - Metastable State
 - Population Inversion.
- c)** Calculate the band gap energy (in eV) in silicon, given that it is transparent to radiation of wavelength greater than 11000 Å.
- $h : 6.63 \times 10^{-34}$ J-sec, $c = 3 \times 10^8$ m/s [3]

OR

- Q4) a)** Explain the working of P-N junction diode in [6]
- Zero bias
 - Forward Bias
 - Reverse Bias
- On the basis of energy level diagram.
- b)** The Hall coefficient of a specimen of doped silicon is found to be 3.66×10^{-3} m³/C. The resistivity of the specimen is 8.93 Ω-m. Determine the mobility of charge carriers. [3]
- c)** What is an optical resonator? What is its role in lasing? [3]
- Q5) a)** State and explain Heisenberg's Uncertainty Principle. Show that it is also applicable for energy and time. [6]
- b)** State and explain de-Broglie hypothesis of matter waves. Explain in brief any two properties of matter waves. [4]
- c)** Lowest energy of an electron trapped in an infinite potential well is 38 eV. Calculate the width of the well. ($e = 1.6 \times 10^{-19}$ C, $h = 6.63 \times 10^{-34}$ J-sec, $m_e = 9.1 \times 10^{-31}$ kg) [3]

OR

- Q6)** a) Starting from de-Broglie hypothesis, derive Schrödinger's time independent wave equation. [6]
b) Explain tunneling effect. How is this principle used in a tunnel diode. [4]
c) Calculate the de-Broglie wavelength for a 10 KeV proton. [3]
($m_p = 1.67 \times 10^{-27}$ kg, $h = 6.63 \times 10^{-34}$ J.s, $e = 1.6 \times 10^{-19}$ C).

- Q7)** a) Explain the following terms of superconductivity with the help of necessary figure. Give formula and graph wherever necessary. [6]
i) Meissner effect
ii) Critical Magnetic Field
b) Give brief explanation of the optical properties of nanoparticles with the help of quantum confinement effect and G Mie equation. [4]
c) Explain the formation of Cooper pairs in superconductors with the help of electron phonon interaction. [3]

OR

- Q8)** a) Explain chemical method for synthesis of nanoparticles by colloidal route with the help of LaMer diagram. Give one example of synthesis of metal nanoparticles. [6]
b) Give the statement of Meissner effect and show that super conductors are perfectly diamagnetic. [4]
c) Explain the Mechanical properties of Nanoparticles [3]

