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 necessarry.***

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 6000AU 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 revereberation? Give Sabine's formula for reberation time. What are the factors affecting reberberation time? Explain how it can be optimized by controling 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/m^2 . Density of iron = 7.23×10^3 kg/m^3 **[3]**

c) The resultant amplitude of a wave when monochromatic light is diffracted from a single slit $E_\theta = E_m (\sin \alpha)/\alpha$, 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]**

i) Stimulated emission

ii) Metastable State

iii) Population Inversion.

c) Calculate the band gap energy (in eV) in silicon,given that it is transparent to radiation of wavelength greater than 11000 AU.

h : 6.63×10^{-34} J-sec, c–3×10^{8} m/s **[3]**

OR

Q4) a) Explain the working of P-N junction diode in **[6]**

i) Zero bias

ii) Forward Bias

iii) 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} m^3/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 =1.6×10^{-19} C,h = 6.63×10^{-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 × 10^{-27} kg, h = 6.63 × 10^{-34} J.s, e = 1.6 × 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]**