Total No. of Questions : 8]

SEAT No. :

P549

[Total No. of Pages : 3

[4456] - 102
F.E. (Semester - I & II)
ENGINEERING PHYSICS
(2012 Course)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Physical Constants –

Avogadro's number = 6.023×10^{23} gms/mole

Charge on electron (e) = 1.6×10^{-19} C

Plank's constant (h) = 6.63×10^{-34} J-sec.

Mass of electron (me) = 9.1×10^{-31} kg.

Velocity of light (c) = 3×10^{8} m/sec.

Q1) a) What are Newton's rings? Draw the experimental set-up to obtain Newton's rings in the laboratory. Show that diameters of Newton's dark rings are proportional to the square root of natural numbers. **[6]**

b) Define the following terms: **[3]**

i) Reverberation.

ii) Intensity of sound.

iii) Timbre of sound.

c) Calculate the natural frequency of vibration for X-cut quartz plate of thickness 5.5 mm. **[3]**

OR

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Q2) a) What is Piezoelectric effect? Explain the method to produce ultrasonic waves by using Piezoelectric oscillator. **[6]**

b) What is diffraction? Distinguish between Fresnel and Fraunhofer diffraction (2 Points). **[3]**

c) Interferences fringes are produced with monochromatic light falling normally on a wedge shaped film of refractive index 1.4. The angle of wedge is 10 sec of an arc and the distance between successive fringes is 0.5 cm. What is the wavelength of light used? **[3]**

Q3) a) Explain the propagation of light through a quartz crystal plate for normal incidence When **[6]**

i) Optic axis is parallel to the crystal surface and lying in the plane of incidence.

ii) Optic axis is perpendicular to the crystal surface and lying in the plane of incidence.

iii) Optic axis is inclined to the crystal surface and lying in the plane of incidence.

b) What is the effect of following factors on the conductivity of semiconductors? **[3]**

i) Increase in impurity of concentration.

ii) Increase in temperature.

iii) Increase in intensity of light.

c) The hall coefficient of a specimen of a doped Silicon is found to be $3.66 \times 10 m^{-3}/C$. The resistivity of the specimen is $8.93 \times 10^{-3} \Omega m$. Determine the mobility of the charge carriers. **[3]**

OR

Q4) a) Explain the classification of solids into conductors, semiconductors and insulators on the basis of band theory of solids. **[6]**

b) Explain the following: **[3]**

i) Stimulated Emission.

ii) Metastable State.

iii) Population Inversion.

c) Calculate the specific rotation of the sugar solution of 4.5% concentration, if the plane of Polarization is rotated through 6.8^0 in passing through a length of 1.8 decimeter of the solution. **[3]**

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Q5) a) Derive an expression for energy of a particle trapped in an infinite potential well. **[6]**

b) State and explain De Broglie's hypothesis of matter waves. State any two properties of matter waves. **[4]**

c) The uncertainty in the location of the particle is equal to its De Broglie wavelength. Show that the uncertainty in the velocity of a particle is equal to the particle velocity itself. **[3]**

OR

Q6) a) State and explain Heisenberg's uncertainty principle. Illustrate it by an experiment of Electron diffraction at a single slit. **[6]**

b) What is wave function ψ ? Write down the conditions satisfied by wave function ψ . **[4]**

c) Calculate the energy difference between the ground state and first excited state of an electron in the rigid box of length 1 A^0. **[3]**

Q7) a) What is superconductivity? Explain the BCS theory of superconductors. **[6]**

b) Explain following properties of Nano-particles: **[4]**

i) Optical property.

ii) Electrical property.

c) Explain the applications of nano particles in medical and electronic field. **[3]**

OR

Q8) a) Explain the synthesis of gold Nano particles by colloidal route method. **[6]**

b) Explain Dc and Ac Josephson effect. **[4]**

c) Distinguish between Type-I and Type-II superconductors. (Any 3 points). **[3]**

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