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**[5558]-103**

**F.E. (II Sem.) EXAMINATION, 2019**

**ENGINEERING PHYSICS**

**(2015 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

1. (a) Explain the formation of Newton's rings. Prove that for Newton's rings in reflected light, the diameters of dark rings are proportional to the square root of natural numbers. [6]
- (b) What is reverberation time ? Explain any *two* measures to control reverberation time in an auditorium. [3]
- (c) In a plane transmission grating, the angle of diffraction for the second order principal maximum for the wavelength  $5 \times 10^{-5}$  cm is  $30^\circ$ . Calculate the number of lines/cm of the grating surface. [3]

*Or*

2. (a) What is piezoelectric effect ? Draw neat and labelled diagram for piezoelectric oscillator and hence explain its construction and working. [6]
- (b) Explain with suitable diagram how interference is used to design antireflection coating. [3]

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- (c) The average reverberation time of a hall is 1.5 sec and the area of interior surface is  $3340 \text{ m}^2$ . If the volume of the hall is  $13000 \text{ m}^3$ . Find absorption coefficient. [3]
3. (a) What is double refraction ? Explain Huygen's theory of double refraction. [6]
- (b) Calculate the number of acceptor to be added to a germanium sample to obtain the resistivity of  $10 \text{ } \Omega\text{-cm}$ . [3]
- (Given :  $\mu = 1700 \text{ cm}^2/\text{volt-sec}$   
 $e = 1.6 \times 10^{-19} \text{ C}$ )
- (c) What is holography ? Explain the process of Hologram recording. [3]
- Or
4. (a) Define Fermi level in conductors and semiconductors. Show that the Fermi level lies at the centre of energy gap in an intrinsic semiconductor. [6]
- (b) A 20 cm long tube containing 48 c.c. of sugar solution rotates the plane of polarization by  $11^\circ$ . If the specific rotation of sugar is  $66^\circ$ , calculate the mass of sugar in the solution. [3]
- (c) List any *three* applications of solar cell. Explain any *one* of them in brief. [3]
5. (a) State and explain Heisenberg's uncertainty principle. Illustrate the principle of electron diffraction at a single slit. [6]

(b) What is De-Broglie hypothesis ? Derive an expression for de-Broglie wavelength for an electron when it is accelerated by potential difference  $V$ . [4]

(c) Lowest energy of an electron trapped in a potential well is 38 eV. Calculate the width of the well. [3]

$$(h : 6.63 \times 10^{-34} \text{ Js})$$

$$(m : 9.1 \times 10^{-31} \text{ kg})$$

Or

6. (a) Deduce Schrodinger's time independent wave equation. [6]

(b) An electron initially at rest is accelerated through a potential difference of 3000 V. Calculate for the electron wave the following parameters : [3]

(i) The de-Broglie wavelength and

(ii) The momentum.

$$(h : 6.63 \times 10^{-34} \text{ Js})$$

(c) Write down the conditions which are to be satisfied by well behaved wave function. [4]

7. (a) Explain optical and electrical properties of nanoparticles. [6]

(b) Explain how colloids are synthesized by the chemical route. [4]

(c) State any six applications of superconductivity. [3]

Or

8. (a) Explain the following terms of superconductivity with the help of necessary figure. Give formula and graph whenever necessary :
- (i) Meissner effect
  - (ii) Critical magnetic field. [6]
- (b) Give any *four* points to distinguish between Type I and Type II superconductors. [4]
- (c) State applications of nano-particle. Explain any *one* application. [3]