

**B. Tech. / B. E. First Semester (FY I-A and II-B) /  
B. Tech. – 20-21 – SOE – FY - 202 Examination**

**Course Code : GE 2105**

**Course Name : Engineering Physics**

Time : 2 Hours ]

[Max. Marks : 40

**Instructions to Candidates :—**

- (1) All questions are compulsory.
- (2) All questions carry marks as indicated.
- (3) Assume suitable data wherever necessary.
- (4) Illustrate your answers wherever necessary with the help of neat sketches.
- (5) Use of Logarithmic tables, non – programmable calculator is permitted.
- (6) **List of Constants :**

Plank's constant  $h = 6.625 \times 10^{-34}$  Js.

Mass of electron  $m_e = 9.1 \times 10^{-31}$  kg.

Mass of Proton  $m_p = 1.67 \times 10^{-27}$  kg.

Charge of electron  $e = 1.602 \times 10^{-19}$  C.

Boltzmann constant  $k = 1.38 \times 10^{-23}$  J/K.

Velocity of light  $c = 3 \times 10^8$  m/s.

1. (A) Explain the formation of Newton's ring with a neat labelled diagram and show that radius of dark rings is proportional to square root of natural number. (CO 1)
- (B) A diffraction grating used at normal incidence gives a green line of wavelength  $\lambda = 5400 \text{ \AA}$  in a certain order  $n$  superimposed on a violet line  $\lambda = 4050 \text{ \AA}$  of next higher order  $(n + 1)$ . If the angle of diffraction is  $30^\circ$ , calculate the spacing between the grating lines. Also find how many lines are there per cm in the grating. 4 + 3 (CO 1)
2. (A) Show that the energy of an electron in one dimensional infinite potential well of width  $L$  is quantized. (CO 2)
- (B) An electron and a **150 gm** baseball are traveling with velocity of **220 m/s** measured to an accuracy of **0.065** percent. Calculate uncertainty in position of each. 4 + 3 (CO 2)

3. (A) Explain Hall effect and hence obtain an expression for Hall voltage and Hall coefficient. (CO 3)
- (B) Calculate the probabilities for an electronic state to be occupied at **20°C**, if the energy of these states lies **0.11 eV** below and above the Fermi level. 4 + 3 (CO 3)
4. (A) Explain how a charged particle describes a helical path in a uniform magnetic field. Obtain the expression for the pitch, radius and time period of the helix. (CO 4)
- (B) A proton accelerates from rest in a uniform electric field of **500 N/C**. At some time later its speed is  **$2.5 \times 10^6$  m/s**. Estimate :
- (i) Acceleration of the proton.
- (ii) Time taken by the proton to reach the above velocity.
- (iii) Distance moved in this time. 4 + 3 (CO 4)
5. (A) Sketch a well labeled block diagram of CRO showing their all details. Explain the roll of sets of horizontal and vertical deflection plates in CRO. (CO 4)
- (B) Determine the cyclotron frequency of a proton in a magnetic field of  **$3.7 \text{ wb/m}^2$** . 4 + 2 (CO 4)
6. (A) Describe the construction and working of Ruby laser with energy level diagram. (CO 5)
- (B) Half - width of the He - Ne laser operating at wavelength  **$6328 \text{ Å}$**  is **1500 MHz**. Compute the length of the laser cavity to ensure that only one longitudinal mode oscillates. 4 + 2 (CO 5)

