PAPER ID—10704

B.Tech. EXAMINATION, 2023

(Second Semester)

CIVIL ENGINEERING

Physics

Time : 3 Hours *Maximum Marks : 70*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting any *four* questions from Unit II. Q. No. **1** (Unit I) is compulsory. All questions carry equal marks.

Unit I

1. (a) What is physical interpretation of the curl of a vector ? 2

(b) Differentiate between bound charges and free charges. 2

(c) What are polar and non polar dielectrics ? 2

(d) Why does the centre of Newton's ring appear dark in reflected light ? 2

(e) What do you mean by resolving power of a diffraction grating ? 2

(f) Why gas laser emit light which is more unidirectional and monochromatic as compared to solid state lasers ? 2

(g) Discuss the variation of position of Fermi energy level with temperature in semiconductors. 2

Unit II

2. (a) Derive boundary conditions for electric field and electric displacement vector. **5**

   (b) Derive Maxwell's equations. Also explain physical significance of each equation. **6**

   (c) Show that electrostatic filed vector is conservative. **3**

3. (a) Derive Laplace and Poisson's equations for electrostatic potentials. What is there importance in Physics ? **7**

   (b) Discuss magnetization in materials and also give the classification of magnetic materials. **7**

4. (a) Explain the term Hysteresis, residual magnetism and coercive force. What is hysteresis loop ? Show that area of B-H loop represented the energy per unit volume per cycle of magnetization. **6**

(b) Derive expression for electric potential due to a continuous charge distribution. 5

(c) Show that the potential function $v = a(x^2 + y^2 + z^2)^{1/2}$ does not satisfy the Laplace's equation. 3

5. (a) Derive an expression for Fraunhoffer diffraction due to a single slit. 5

(b) What are solid state laser ? Discuss the construction and workings of Ruby laser. What are its limitations ? 6

(c) What is the origin of band gap ? 3

6. (a) Explain, how Michelson interferometer can be used to determine the wavelength of monochromatic light and thickness of a thin sheet ? 6

(b) State and prove the Bloch's theorem for periodic potential. 5

(c) A Laser source is operating at 632.8 nm. Calculate the ratio of stimulated emission to spontaneous emission coefficient. 3

7. (a) Show how Fermi level depends on carrier concentration and temperature ? 6

(b) What is the difference between interference and diffraction of light ? 4

(c) What is the highest order spectrum which may be seen with the light of wavelength 5×10^{-5} cm by means of a grating with 4000 lines/cm ? Calculate the wavelengths in the visible spectrum (3.5×10^{-5} cm to 7.0×10^{-5} cm) which coincide with the fifth order spectrum of this light. 4