Roll No. .....

TPH–101

B. TECH. (FIRST SEMESTER)
END SEMESTER EXAMINATION, Jan., 2023

ENGINEERING PHYSICS

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any ***two*** sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are twenty.

(iv) Each sub-question carries 10 marks.

1. (a) In the wedge-shaped film derive the expression for total path difference. Hence obtain the conditions for maxima and minima. (CO1)

(b) In N-slit Fraunhofer diffraction using the general expression for the intensity obtain the conditions for principal maxima, minima, and secondary maxima. Hence calculate the intensity of the principal maxima. (CO1)

(c) A grating having 15000 lines per inch produces spectra of a mercury arc. The green line of the mercury spectrum has a wavelength of 5461 Å. What is the angular separation between the first order and second order green line ? (CO1)

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2. (a) What is meant by polarization of light ? Discuss the production of elliptically and circularly polarized light using doubly refracting crystal.

   (b) For the sodium light of wavelength + = 5890Å, if the velocities of ordinary and extraordinary rays in a calcite crystal are 2.7×10^8 m/s and 2.95×10^8 m/s what should be the thickness of the wave plate to produce : (CO2)

   (i) linearly polarized light

   (ii) circularly polarized light ?

   (c) For a two-level system explain the process of stimulated emission. Derive the relation between the Einstein's coefficients. (CO2)

3. (a) Write the postulates for special theory of relativity. Derive the Lorentz transformation equations for space and time coordinates. (CO3)

   (b) Using the Lorentz transformation equations derive the expression for length contraction and time dilation. (CO3)

   (c) Derive the Einstein mass energy relation $E = mc^2$. (CO3)

4. (a) Discus the various top-down and bottom-up approach in the synthesis of nanoparticles. (CO4, CO5)

   (b) Explain the phenomena of superconductivity. Write the differences between Type I and type II superconductors. Discuss Meissner effect in superconductors. (CO4, CO5)

   (c) Describe the Quantum Well, Wire and Dot nanostructures. Describe in detail with the help of diagram the ball milling method (mechanical method) used in synthesis of nanoparticles. (CO4, CO5)

5. (a) Derive Schrodinger time dependent and independent wave equation.

(CO6)

(b) Derive the expression for the eigenvalue of energy of a particle confined in one-dimensional box of infinite height also establish its normalized wave function for the ground level and first excited level. (CO6)

(c) Find the first three energy levels of an electron moving in one dimension in an infinitely high potential box of width 10^{-8} cm. (Given mass of electron = 9.11×10^{-28} gm). (CO6)