(c) Derive Maxwell's equations in integral and differential form and explain their physical significance. (CO4)

5. (a) What is de Broglie's hypothesis ? Calculate de-Broglie wavelength of photon, electron and gas molecules. (CO5)

(b) What is Heisenberg's uncertainty principle ? Calculate the uncertainty in the measurement of the momentum of an electron if the uncertainty in locating it is 1Å. (CO5)

(c) What are the physical significances of the wave equation ψ ? Obtain the time-independent Schrodinger wave equation. (CO5)

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TPH–201

B. TECH. (SIXTH SEMESTER)
END SEMESTER
EXAMINATION, July/Aug. 2022

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 question carries 10 marks.

1. (a) Obtain an expression for fringe width in the case of Newton's rings experiment. Prove that in this case of interference dark rings are directly proportional to square root of all natural numbers. (CO1)

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(b) In Newton's ring arrangement a source is emitting two wavelength $\lambda_1 = 6.0 \times 10^{-7}$ m and $\lambda_2 = 5.9 \times 10^{-7}$ m. It is found that nth dark ring due to one wavelength coincides with $(n + 1)^{th}$ dark ring due to the other. Find the diameter of the nth dark ring if the radius of curvature of the lens in 0.9 m. (CO1)

(c) Describe Fraunhofer diffraction due to a single slit and deduce the positions of the maxima and minima. Show the relative intensity of successive maxima. (CO1)

2. (a) Explain the spontaneous and stimulated emission of radiation and derive the relation between Einstein's coefficient. (CO2)

(b) On introducing a polarimeter tube 25 m long and containing sugar solution of unknown strength, it is found that the plane of polarization is rotated through 10°. Find the strength of the sugar solution in g/cm^3. (Given that the specific rotation of sugar solution is 60° per decimeter per unit concentration). (CO2)

(c) Explain the phenomenon of double refraction. Describe the theory of double refraction with a suitable diagram and also find the thickness of half wave plate. (CO2)

3. (a) Apply Lorentz transformation to derive the expression for length contraction and time dilation. (CO3)

(b) The mass of a moving electron is 11 times its rest mass. Calculate its kinetic energy and momentum. ($m_e = 9.1 \times 10^{-31}$ Kg.) (CO3)

(c) Derive the relation of variable mass of a body and prove mass is variable with velocity in relativistic mechanics. (CO3)

4. (a) What is superconductivity ? Distinguish between type I and type II superconductors. (CO4)

(b) In a plane transmission grating the angle of diffraction for the second order principal maximum for the wavelength is 5×10^{-5} cm is 30°. Calculate the number of lines in one centimeter of the grating surface. (CO4)