TPH–101

B. TECH. (FIRST SEMESTER)
END SEMESTER EXAMINATION, 2019

(ALL BRANCHES)

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.

1. Attempt any *two* parts of choice from (a), (b) and (c).　　(2×10=20 Marks)

   (a) What is the Rayleigh's criterion for resolving of grating ? Derive the expression for resolving power of grating.　　(CO1)

   (b) Derive the equation of continuity and discuss its physical significance.

   　　　(CO4)

   (c) A light source emits visible light of two wavelengths 430 nm and 510 nm. The source is used in a double-slit interference experiment in which D = 1.50 m and d = 0.0250 mm. Find the separation distance between the third-order bright fringes.　　(CO1)

2. Attempt any *two* parts of choice from (a), (b) and (c).　　(2×10=20 Marks)

   (a) Draw the energy level diagram and explain the working of He-Ne Laser.　　(CO2)

   (b) A certain length of 5% solution causes the optical rotation 20°. How much length of 10% solution of the same substance will cause 35° rotation ?　　(CO2)

(c) Describe the method to produce and analyses plane, circularly and elliptically polarized light with the help of Nicol prism and quarter wave plate. (CO2)

3. Attempt any *two* parts of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Discuss the Michelson-Morley experiment and explain its negative results. (CO3)

(b) Compute the mass m and speed v of an electron having kinetic energy 1.5 MeV. Given that the rest mass of electron $m_0 = 9.1 \times 10^{-31}$ kg and the velocity of light in vacuum $c = 3 \times 10^8$ m/s. (CO3)

(c) Describe the Einstein's postulates of special theory of relativity and use it to derive the Lorentz transformation equation. (CO3)

4. Attempt any *two* parts of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What is Superconductivity ? Explain Type-I and Type-II superconductors. (CO5)

(b) Derive the four Maxwell's equations and discuss its physical significance. (CO4)

(c) Explain briefly Meissner effect. Calculate the temperature at which the critical magnetic field is two-third of the value at 0°K for tin superconductor which has critical temperature 4°K. (CO5)

5. Attempt any *two* parts of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Derive the Schrödinger time-dependent and independent wave equations. (CO6)

(b) Determine the velocity and kinetic energy of a neutron having de Broglie wavelength 2 Å. (Mass of neutron $= 1.67 \times 10^{-27}$ kg and $h = 6.63 \times 10^{-34}$ J-s).

(c) Derive the wave function of particle in one-dimensional infinite potential well. Plot the wave function and probability densities for energy level $n = 1, 2, 3$ and 4. (CO6)

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