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.

(v) Instructions on how to attempt a question are mentioned against it.

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

(a) In Fresnel's biprism experiment the fringes of 0.19 mm width are formed on the screen placed at a distance of 1.0 m from the slits. A convex lens is palced at a distance of 30 cm from the images of two coherent sources. The separation between the two images was found to be 0.70 cm. Calculate the wavelength of light used.

(CO1)

(b) With the help of a neat diagram show an experimental arrangement to produce Newton's rings by reflected sodium light. Prove that in reflected light the diameter of the dark rings is proportional to the square root of the natural number.   (CO1)

(c) Discuss Fraunhofer diffraction due to N slits. Also find the ratio of intensity of secondary and principal maxima.   (CO1)

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

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

(CO2)

(b) A light ray enters from air to a fibre. The refractive index of the air is 1.0. The fibre has refractive index of core is equal to 1.5 and that of cladding is 1.48. Find the critical angle, the fractional refractive index, the acceptance angle and numerical aperture.   (CO2)

(c) Explain with the help of a neat diagram the working of Ruby Laser. Also write the drawbacks of this laser.   (CO2)

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

(a) At what speed should a clock be moved so that it may appear to lose 1 minute in each hour.   (CO3)

(b) What are postulates of special theory of relativity. Explain the variation of mass with velocity by proof of equation of mass variation.   (CO3)

(c) Explain Michelson-Morley experiment with the neat diagram. How this experiment helpful to prove that ether medium cannot exist in the Universe.

(CO3)

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

(a) Write Maxwell's equations in integral and differential form. Prove differential form of Maxwell fourth equation.   (CO4)

(b) Show that the electromagnetic waves propagate in free space with the velocity of light.   (CO4)

(c) A tube of sugar solution 20 cm long is placed between crossed nicols and illuminated with light of wavelength 6×10^{-5} cm. If the optical rotation produced is 13 degree and the specific rotation is $65° dm/g/cm^3$, determine the strength of the solution.   (CO4)

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

(a) (i) Find deBroglie wavelength of a neutron of energy 12.8 MeV (given mass of neutron 1.675×10^{-27} kg.).

(ii) An electron is accelerated through a potential difference 100 volt. Calculate the deBroglie wavelength associated with the electron.   (CO5)

(b) Derive time dependent Schrödinger equation with the help of energy and momentum operator.   (CO5)

(c) Write and explain Heisenberg's Uncertainty Principle in two forms. Also explain that electron cannot exist inside the nucleus by uncertainty principle.(CO5)