Roll No. ..... H

TPH–101

B. TECH. (FIRST SEMESTER)

END SEMESTER EXAMINATION, 2019

(ALL BRANCHES)

ENGINEERING PHYSICS

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions.

(ii) All questions are compulsory.

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

(iv) Total marks for each main question are **twenty**.

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

   (a) Explain the phenomenon of interference of light and derive the condition of constructive interference in thin film for reflected light.

   (b) In Newton's ring experiment the diameter of 4th and 12th dark rings are 0.400 cm and 0.800 cm respectively.

   Find the following :

   (i) Diameter of 20th ring

   (ii) Radius of curvature of the lens if the light of $\lambda = 6000$ Å is used.

   (c) Explain Fraunhofer and Fresnel's diffraction. Find the intensity in diffraction due to N slits.

2. Attempt any *two* parts 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.

(b) A certain ruby laser emits 20 J pulses of light whose wavelength is 700 nm. What is the minimum number of active ions in the ruby laser ?

(c) Explain the following :

(i) Specific rotation

(ii) Phenomenon of double refraction

(iii) Retardation plates

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

(a) Derive Maxwell's four equations. Explain the need of modification of fourth equation.

(b) A magnetizing field of 1000 A/m produces a magnetic flux of 2×10^{-5} Weber in a bar of iron of 0.2 cm^2 cross-section. Calculate the permeability and susceptibility of bar.

(c) What is nano-science and technology ? Explain quantum wire, quantum dots and CNT.

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

(a) Explain the objective of Michelson-Morley experiment with the help of neat diagram and also discuss its negative results.

(b) Find the kinetic energy and momentum of the particle whose mass is two times rest mass of an electron ($m_e = 9.1 \times 10^{-31}$ kg).

(c) What is the fundamental principle of hologram ? How is it produced and how is the image constructed from it ?

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

(a) What is uncertainty principle ? Derive time independent Schrödinger wave equation.

(b) Calculate the energy difference between the ground state and first excited state for electron if the length of the box is 10^{-8} cm.

(c) What is fibre optics ? Derive the formula of acceptance angle and numerical aperture in fibre optics.