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TPH–201

B. Tech. (Second Semester)
End Semester EXAMINATION, 2017
(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 mention against it.

(iv) Total marks assigned to each question are **twenty.**

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

(a) What are the conditions of sustained interference ? Prove that in Newton's ring experiment, the diameter of bright rings are directly proportional to the square root of odd natural numbers.

(b) Newton's rings are observed in reflected light of wavelength 590 nm. The diameter of the 10th dark ring is 0.005 m. Find the radius of curvature of the lens and the thickness of the air film.

(c) What is diffraction ? Find the ratio of intensity secondary maxima and primary maxima in diffraction due to N slits.

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

(a) How retardation plates are used to find circular and eleptically polarised light ? Give working of half shade polarimeter.

(b) Calculate the thickness of a calcite plate which would convert plane polarised light into circularly polarised light. The principal refractive indices of 0 and e rays are 1.658 and 1.486 respectively at the wavelength of light used as 589 nm.

(c) What is principle of laser action ? Give construction and working of He-Ne laser.

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

(a) Derive Maxwell's four equations. Also find the modified fourth equation.

(b) A magnetising field of 1600 A/m produces a magnetic flux of 2.4×10^{-5} Weber in an iron bar of cross-sectional area 0.2 cm^2. Calculate permeability and susceptibility of the bar.

(c) Explain quantum wire, quantum dots and quantum well. What are the applications of nano physics ?

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

(a) Discuss briefly construction and working of Michaelson-Morley experiment and mention its outcome.

(b) In Michaelson-Morley experiment, the wavelength of the monochromatic light used is 500 nm. What will be the expected fringe shift on the basis of the stationary ether hypothesis if the effective length of each path is 5 m ? (Velocity of the earth = 3×10^4 m/s and $c = 3 \times 10^8$ m/s).

(c) What are Einstein postulates of relativity ? Derive Lorentz transformation equations, length contraction and time dillation.

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

(a) What is Heisenberg Uncertainty principle ? Derive time dependent and independent Schrödinger wave equation.

(b) Energy of a particle at absolute temperature T is of the order of kT. Calculate the wavelength of thermal neutrons at 27°C. Given the mass of neutron = 1.67×10^{-27} kg. Planck's constant $h = 6.6 \times 10^{-34}$ J-sec and the Boltzman's constant $k = 8.6 \times 10^{-5}$ eV/degree.

(c) Explain about the principle of propagation mechanism of EM wave in fibre optics. Derive the formula of acceptance angle and numerical aperture.