1E3102

Roll No. _____ Total No. of Pages: 3

1E3102

B. Tech. I - Sem. (Main / Back) Exam., - 2023

1FY2 – 02 Engineering Physics

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Excessively thin film appears dark why?

Q.2 What do you mean by resolving power of an optical instrument?

Q.3 What is normalized and orthogonal wave function?

Q.4 Explain total internal reflection.

Q.5 What are the relation between Einstein's Coefficients? Explain them.

Q.6 What is Hall effect?

Q.7 What is scalar and vector field?

Q.8 Define curl and divergence of a vector.

Q.9 What do you mean by spectral purity?

Q.10 What will be the effect on diameters in Newton's ring experiment if film is of μ refractive index?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Two coherent sources of intensity ratio α interfere. Prove that in the interference pattern $\frac{Imax - Imin}{Imax + Imin} = \frac{2\sqrt{\alpha}}{1+\alpha}$

Q.2 A single slit is illuminated by light composed of two wavelengths λ_1 and λ_2. One observes that due to diffraction, the first minima obtained for λ_1 coincides with the second diffraction minima of λ_2. What will be the relation between λ_1 and λ_2?

Q.3 A laser beam has a power of 50 mw. It was an aperture of 5×10^{-3}m and wavelength 7000 Å. A beam is focused with a tens of focal length 0.2 m. Calculate the area spread and intensity of the image.

Q.4 An optical fibre has a numerical aperture of 0.2 and cladding refractive index of 1.59. Determine the acceptance angle for the fiber in water which has a refractive index of 1.33.

Q.5 An electric field of 100 V/M is applied to a sample of n-type semi conductor whose Hall coefficient is $-0.0125m^2$/ Coulomb. Determine the current density in the sample assuming mobility of electrons is $0.36m^2$/V/S.

Q.6 Derive Laplace's and Poisson's equations starting from the differential form of Gauss's Law.

Q.7 Find the probability that a particle is in one dimensional box of length l can be found between 0.45 l and 0.55 l for the ground and first excited states.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Describe and explain the formation of Newton's rings in reflected monochromatic light. How can these be used to determine the wavelength of light? Derive the formula used. [6+4=10]

Q.2 (a) Derive the Schrodinger time dependent equation and explain the physical meaning of wave function ψ. [8]

(b) What do you mean by degeneracy? [2]

Q.3 (a) Discuss the formation of energy bands in solids. [5]

(b) Classify the solids on the basis of energy bands and discuss the conductivity in semiconductors. [3+2=5]

Q.4 Derive the formula for curl and divergence for electrostatic field and static magnetic field. [5+5=10]

Q.5 (a) What is an optical fibre? Obtain an expression for numerical aperture of step index optical fibre. [5]

(b) Explain visibility of fringes as a measure of coherence. [5]
