2E3203

Roll No. _____ Total No. of Pages: 3

2E3203

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

2FY2 – 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 questions 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 How do circular fringes originate in Michelson's interferometer?

Q.2 Calculate the longest wavelength that can be analyzed by a crystal of spacing d = 3.64 Å in the second order.

Q.3 What is wave function and write basic postulates of wave function?

Q.4 Define the term matter wave and wave-particle duality.

Q.5 Define spatial and temporal coherence.

Q.6 What is the difference between absorption, spontaneous and stimulated emission?

Q.7 Write a difference between intrinsic and extrinsic semiconductors.

Q.8 State Faraday's and Bio-Savart Law.

Q.9 Write threshold conditions for laser action.

Q.10 Define Fermi dirac function and Fermi energy.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Light of wavelengths 5000 Å and 5200 Å falls normally on a plane transmission grating having 4000 lines per cm. If a lens of focal length 100 cm is used to view spectrum on a screen, find the distance between the two lines in the first order.

Q.2 Consider a particle moving in a one-dimensional potential box of infinite height of 25×10^{-10} m width. Estimate the probability of finding the particle within an interval of 5×10^{-10} m at the center of the box when it is in its state of least energy.

Q.3 A gaseous medium gives a laser at an infrared wavelength of 3.4 μm. What is the difference of energy between the upper and lower levels?

Q.4 The spectral spread of a red cadium light of wavelength 694.3 nm is 0.001 nm. Calculate spectral purity factor, coherence length or coherence time.

Q.5 If a potential function is given by the expression $\phi = xyz$, determine the potential gradient and also prove that the vector is ir-rotational.

Q.6 Calculate the conductivity of the intrinsic germanium at 300 K. Given $n_i = 2.4 \times 10^{19}$ per m^3, $\mu_e = 0.39\ m^2V^{-1}s^{-1}$ and $\mu_p = 0.19\ m^2V^{-1}s^{-1}$.

Q.7 In an He-Ne laser system, the two energy levels of Ne involved in lasing action have energy values of 20.66 eV and 18.76 eV. Population inversion occurs between these two levels. What will be the wavelength of a laser beam produced?

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Derive an expression for the intensity of diffracted light in the Fraunhofer diffraction due to a single slit and deduce the position of the maxima, minima and secondary maxima.

Q.2 Derive time dependent and time independent Schrodinger wave equation.

Q.3 Explain the construction and working of He-Ne laser. Draw necessary diagrams. What is the role of He in this laser?

Q.4 Show that Hall Effect is independent of the applied magnetic field and is inversely proportional to the current density and electronic charge.

Q.5 State and prove Pointing Theorem for the rate of flow of energy in electromagnetic field. What is pointing vector?
