

2E3203

Roll No. _____

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B.Tech. II Sem. (Main) Examination, July - 2022
2FY2-02 Engineering Physics

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

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 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).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. What will happen if we use a lens (Newton's Ring) of small radius of curvature?
2. What do you mean by "Q" factor for light?
3. State Rayleigh's criterion of resolution.
4. What is the physical interpretation of wave-function?
5. Define spatial and temporal coherence.
6. Write threshold conditions for laser action.
7. What is the difference between spontaneous and stimulated emission.
8. State Faraday's Law and Bio-Savart Law.
9. What do you mean by Maxwell's equations?
10. What do mean by covalent and metallic bonding.

PART - B

(Analytical/Problem solving questions)

Attempt any **Five** questions:

(5×4=20)

1. What is Numerical Aperture (NA) of an optical fibre? What does the numerical aperture signify?
2. Calculate the conductivity of the intrinsic germanium at 300 K. Given $n_i = 2.4 \times 10^{19}/\text{m}^3$, $\mu_e = 0.39 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$ and $\mu_p = 0.19 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$.
3. An electron is confined to a one dimensional box of side 1 \AA . Obtain the first four eigenvalue of the electron in eV.
4. A diffraction grating just resolves lines 4547.27 \AA and 4547.98 \AA in third order. Will it resolve lines 6437.48 \AA and 6437.95 \AA in the first order?
5. Give the construction and working of semiconductor laser. Draw necessary energy level diagrams.
6. In an He-Ne laser system, the two energy levels of Ne involved in lasing action have energy value of 20.66 eV and 18.76 eV. Population inversion occurs between these two levels. What will be the wave length of a laser beam produced?
7. Explain fermi-Dirac distribution function and fermi energy.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Three** questions:

(3×10=30)

1. A plane transmission grating produces an angular separation of 0.01 radian between two wavelengths observed at an angle of 30° . If the mean value of the wavelength is 5000 \AA and the spectrum is observed in the second order, calculate the difference in the two wavelengths.
2. The spectral spread of red cadmium light of wavelength 694.3 nm is 0.001 nm. Calculate spectral purity factor, coherence length and coherence time.
3. Show that the Hall coefficient is independent of the applied magnetic field and is inversely proportional to the current density and electronic charge. Mention the application of Hall Effect.
4. State and prove Poynting theorem for the rate of flow of energy in electromagnetic field. What is Poynting vector?
5. Prove that in high frequency region Laser action is not possible.