

2E3203

Roll No. _____

Total No. of Pages: **4****2E3203****B. Tech. II - Sem. (Main / Back) Exam. - 2026****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 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. NIL2. NIL**PART – A****[10×2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

- Q.1 In Newton's Ring experiment, explain why the central fringe is dark in reflected light? [2]
- Q.2 What do you understand by Bragg's condition for x-ray diffraction? [2]
- Q.3 Define group velocity. [2]
- Q.4 Give two differences between Temporal coherence and Spatial coherence. [2]
- Q.5 What do you mean by 'visibility as a measure of coherence'? [2]

- Q.6 Mention unit(s) of Einstein's coefficients. [2]
- Q.7 Give two properties of Laser. [2]
- Q.8 Write expression for Fermi-Dirac Distribution function. Given its value at $E = E_f$. [2]
- Q.9 Write Laplace equation and mention its one application. [2]
- Q.10 Mention physical significance of 'Poynting vector' in brief. [2]

PART - B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1 In Newton's ring experiment by reflected light, the diameter of the 4th and 12th dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of 20th dark ring. What will be the order of dark ring which is formed where thickness of air film is equal to wavelength of light used? [2+2=4]
- Q.2 Derive an expression for resolving power of a Grating. [4]
- Q.3 Derive the Schrödinger's time independent wave equation. [4]
- Q.4 What is spectral purity? Deduce an expression for coherence length and coherence time in terms of spectral purity. <https://www.pyqonline.com> [1+1½+1½=4]
- Q.5 Explain the essential requirement for production of laser. How could probability of stimulated emission be increased? [2+2=4]
- Q.6 An electric field of 100 V/m is applied to a sample of n-type semiconductor whose Hall coefficient is $-0.0125 \text{ m}^3\text{C}^{-1}$. Determine the current density in the sample assuming $\mu_s = 0.36 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$. [4]
- Q.7 Explain Solenoidal vector field and Irrotational field. Give one example of each. [1+1+1+1=4]

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

- Q.1 Explain the working of Michelson's Interferometer. How circular fringes be produced with it? Also obtain the expression for radii of these circular fringes. **[3+3+4=10]**
- Q.2 Solve Schrödinger's equation for a particle trapped in 3D cubical box of dimension 'L'. Also explain the following - **[6+2+2=10]**
- (i) Degeneracy
 - (ii) Order of degeneracy
- Q.3 With schematic diagram, explain the structure and operation of optical fiber. Explain the following terms - **[6+4=10]**
- (i) Critical Angle
 - (ii) Numerical Aperture
 - (iii) Acceptance angle and Acceptance cone
- Q.4 What are the basic requirements of semi-conductor laser? Draw its label diagram and explain its working with necessary theory. **[4+6=10]**
- Q.5 Deduce the Maxwell's equation in integral and differential form for free space and discuss their physical significance. **[10]**
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