

**2E3203**

Roll No. \_\_\_\_\_

Total No. of Pages: **3****2E3203****B. Tech. II - Sem. (Main / Back) Exam., - 2024****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. NIL2. NIL**PART - A****[10×2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

- Q.1 Why Newton's rings are circular in shape?
- Q.2 Define matter waves.
- Q.3 Write two differences between spatial and temporal coherence.
- Q.4 Mention the units of Einstein's coefficients of spontaneous emission and stimulated emission.
- Q.5 Write Expression for Fermi-Dirac distribution function.
- Q.6 Mention two properties of metallic bond.

- Q.7 State physical significance of curl of static magnetic field.
- Q.8 Write expression for Bio-Savart's Law in vector form.
- Q.9 Express Bragg's condition for X-ray diffraction.
- Q.10 The coherence time for sodium light of wavelength  $5896 \text{ \AA}$  is  $10^{-10}$  sec. What is the maximum thickness of the film that could be measured using interference of sodium light?

## PART – B

[5×4=20]

### (Analytical/Problem solving questions)

#### Attempt any five questions

- Q.1 Michelson interferometer experiment is performed with a source which have two wavelength  $5882 \text{ \AA}$  and  $5886 \text{ \AA}$ . By what distance, does the mirror have to be move between two positions of disappearance of fringes?
- Q.2 ✓ Derive time independent Schrodinger's wave equation. ✗
- Q.3 Two wave-trains overlaps 40% of their length. If the maxima in the resulting interference pattern receives 20 units of light, how much do the minima receives? ✗
- Q.4 ✓ Explain the essential requirement for production of laser action. ✗
- Q.5 ✓ Derive an expression for Hall coefficient. Mention two applications of Hall effect. ✗
- Q.6 Deduce the expression for Poynting vector and explain its physical meaning.
- Q.7 ✓ A parallel beam of sodium light is incident normally on a plane transmission grating having 4250 lines/cm and a second order spectral line is observed at an angle  $30^\circ$ . Determine the wavelength of light.

## PART – C

[3×10=30]

### (Descriptive/Analytical/Problem Solving/Design Questions)

#### Attempt any three questions

- Q.1 Describe Fraunhofer diffraction due to a single slit. Deduce the position of maximas and minimas.
- Q.2 Show that energy of an electron confined in a 1D potential well of length 'L' and infinite depth is quantized. Is the electron allowed to have zero energy? Comment.
- Q.3 What are the basic requirements of semi-conductor laser? With the help of energy band diagram explain working of semi-conductor laser.
- Q.4 (a) Explain clearly the propagation of an electromagnetic wave inside an optical fibre.  
(b) An optical fibre has NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water which has a refractive Index of 1.33.
- Q.5 Deduce the expressions for Maxwell's Equations in integral and differential form. Also discuss their physical significance.

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