

- (b) Derive a relation between group velocity and phase velocity in dispersive medium. What will be the relation if medium is non-dispersive?
- (c) What do you mean by Bragg's law? Describe Bragg's spectrometer.
5. (a) What do you mean by Poynting vector? Derive Poynting theorem and explain its physical significance.
- (b) Explain the concept of displacement current. How it led to the modification of Ampere's law?
- (c) Explain acceptance angle. What do you mean by numerical aperture? Derive expressions for them.
6. (a) Show that the relativistic invariance of the law of conservation of momentum leads to the concept of variation of mass with velocity.
- (b) Establish Einstein's mass-energy relation.
- (c) Show that space time interval  $x^2 + y^2 + z^2 - c^2 t^2$  is invariant under Lorentz transformation.

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No. of Printed Pages : 04

Following Paper ID and Roll No. to be filled in your Answer Book.

**PAPER ID : 49902**Roll  
No.

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**B. Tech. Examination, 2024-25**

(Odd Semester)

**ENGINEERING PHYSICS***Time : Three Hours]**[Maximum Marks : 60***Note :-** Attempt all questions.**SECTION - A**

1. Attempt all parts of the following :  $8 \times 1 = 8$
- (a) Why Newton's rings are circular?
- (b) What do you mean by specific rotation?
- (c) Distinguish between Fresnel and Fraunhofer class of diffraction.
- (d) Find the De-Broglie wavelength of an electron accelerated from rest through a potential difference of 100 volts.

*/ P. T. O.*

- (e) What is equation of continuity?
- (f) What is the principle of optical fibre?
- (g) What was the objective of Michelson-Morley experiment?
- (h) What are inertial and non-inertial frame of references?

### SECTION – B

2. Attempt any two parts of the following :  $2 \times 6 = 12$

- (a) In Newton's rings experiment, the diameter of 4<sup>th</sup> and 12<sup>th</sup> dark rings are 0.4 cm and 0.7 cm respectively. Find the diameter of 20<sup>th</sup> dark ring.
- (b) An electron has speed of 600 m/s with an accuracy of 0.005%. Calculate the uncertainty in the position of electron.
- (c) A particle of rest mass  $m_0$  moves with speed  $C\sqrt{2}$ . Calculate its mass, momentum, total energy and kinetic energy.

- (d) Calculate the numerical aperture, acceptance angle and the critical angle of optical fibre if the core refractive index is 1.50 and cladding refractive index is 1.45.

### SECTION – C

**Note :-** Attempt all questions. Attempt any two parts from each questions.  $8 \times 5 = 40$

- 3. (a) Discuss the effect of introducing a thin plate in the path of one of the interfering beams in biprism experiment. Deduce an expression for the displacement of fringes.
- (b) Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the relative intensities of successive maxima are nearly :
 
$$1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} : \frac{4}{49\pi^2} : \dots\dots\dots$$
- (c) Explain the construction and working of Nicol prism.
- 4. (a) Derive Schrodinger's time independent wave equation.

[P.T.O.]