

## Section - B.

### Short type:

- Q.1. Show that  $x^2 + y^2 + z^2 - c^2 t^2$  is invariant under Lorentz transformation.
- Q.2. Prove the relation  $E^2 - p^2 c^2 = m_0^2 c^4$
- Q.3. Show that the circle  $x^2 + y^2 = a^2$  in frame S appears to be ellipse in frame S' which is moving with velocity V along x-axis relative to S.
- Q.4. At what speed a rocket should be projected into the space so that it should appear to be contracted to 1/4 of its original length.
- Q.5. If the kinetic energy of a body is twice its mass energy, find its velocity.
- Q.6. A clock measures the proper time. With what velocity it should travel relative to an observer so that it appears to go slow by 30 seconds in a day.
- Q.7. White light falls normally on a Soap film ( $\mu = 1.33$ ) of thickness  $5000 \text{ \AA}$ . ~~The diameter of the 10th dark ring is 0.5 cm~~ what wavelength within the visible spectrum ( $4000 \text{ \AA}$  to  $7000 \text{ \AA}$ ) will be strongly reflected.
- Q.8. Newton rings are observed in reflected light of wavelength  $5900 \text{ \AA}$ . The diameter of the 10th dark ring is  $0.5 \text{ cm}$ . Find the radius of curvature of the lens and thickness of the air film.
- Q.9. The distance between the slit and biprism and that between the biprism and screen are each  $50 \text{ cm}$ . The obtuse angle of biprism is  $179^\circ$  and its refractive index is  $1.5$ . If the width of the fringes is  $0.0135 \text{ cm}$  Calculate the wavelength of light.
- Q.10. A diffraction grating which has 4000 lines to a cm. is used at normal incidence. Calculate the dispersive power of the grating in the 3rd order spectrum of wavelength region  $5000 \text{ \AA}$

- Q.11. A 20 cm. long tube containing  $48 \text{ cm}^3$  of sugar solution rotates the plane of polarization by  $11^\circ$ . If the specific rotation of sugar is  $66^\circ$ , calculate the mass of sugar in solution.
- Q.12. Calculate the specific rotation which rotates the plane of polarization  $15.2^\circ$  in 20% sugar solution of 25 cm. length.
- Q.13. The coherence length of Na light is  $2.945 \times 10^{-2} \text{ m}$  and its wavelength is  $5890 \text{ \AA}$ . Calculate:  
i) frequency                      ii) coherence time.
- Q.14. Calculate the energy and momentum of a photon of laser beam of He-Ne Laser.
- Q.15. Differentiate between Photography and Holography?
- Q.16. Discuss some common applications of optical fibre in communication?
- Q.17. Explain the terms:  $\Rightarrow$  a) Numerical aperture b) acceptance angle.