

OR

Explain plane of polarization and plane of vibration with a diagram. (3)

6. Distinguish between group velocity (v_g) and phase velocity (v_p)? (3)

OR

Illustrate the working principle of Nicol prism as polarizer. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. A Newton's ring experiment is performed with a source of light having two wavelengths λ_1 and λ_2 . It is found that the n^{th} dark ring due to λ_1 coincides with $(n+1)^{\text{th}}$ dark ring due to λ_2 . If the radius of curvature of the Plano-convex lens is R, then prove

that the radius of the n^{th} order dark ring for λ_1 is given by $\sqrt{\frac{\lambda_1 \lambda_2}{\lambda_1 - \lambda_2} R}$.

8. Explain the terms a) Ordinary Ray and b) Extraordinary Ray. (5)

9. Estimate the thickness of a mica sheet required to make a quarter wave plate for $\lambda = 546$ nm. (5)
The refractive indices for the O-ray and E-ray in mica are 1.586 and 1.592 respectively.

10. What do you mean by monochromatic light? Define Temporal coherency and spatial coherency. (5)

11. A vibrator of 10 g mass is acted on by a restoring force of 15 dyne/cm and a damping force 2 dyne/cm. Find whether the motion is over damped or oscillatory. (5)

OR

In a Young's double slit experiment, the distance between the slits is 0.1mm and the perpendicular distance of the screen from the plane of the slits is 50cm. Find the separation on the screen between maxima for violet light ($\lambda = 400$ nm) and the red light ($\lambda = 700$ nm) in the first order. (5)

12. What do you mean by total internal reflection and critical angle? Explain with a diagram. (5)

OR

The intensity distribution for a single-slit Fraunhofer diffraction is given by (5)

$I = I_0 \left(\frac{\sin^2 \alpha}{\alpha^2} \right)$ where $\alpha = \frac{\pi b \sin \theta}{\lambda}$, where b is the width of the slit and λ is the wavelength of light. Show that secondary maxima are given by the equations $\tan \alpha = \alpha$
