ISLAMIC UNIVERSITY OF TECHNOLOGY

Organization of Islamic Cooperation

Board Bazar, Gazipur

OPTICS

PHY 4141

Prof. Dr. Firoz Alam Khan

Chapter 43 - Interference

10. Show that the half-width of the double-slit interference fringes is given by if is small enough so that .

Answer:

Set, where is the angle at which intensity falls to half of the maximum value.

Then,

14. In a Newton’s Rings experiment, the radius of curvature of the lens is and its diameter is . Assume .

1. How many rings are produced?
2. How many rings will be seen if the arrangement were immersed in water ()?

Answer:

1. Radius of bright Newton ring,

1. If the arrangement is immersed in water, the number of rings that can be seen are:

Chapter 44 – Diffraction

1. In a single-slit diffraction pattern, the distance between the first minimum on the right and the first minimum on the left is . The screen on which the pattern is displayed is from the slit and the wavelength is . Calculate the slit width.

Answer:

For minimum,

where , , etc and is the slit width.

If is the distance of the minima from the central maxima, and is the slit screen distance, then

provided that

But,

Setting for the first minima,

2. A plane wave () falls on a slit with . A converging lens () is placed behind the slit and focuses on the screen. What is the linear distance on the screen from the center at the pattern to:

1. The first minimum and
2. The second minimum

Answer:

1. Linear distance on the screen from the centre of the pattern to the first minima is given by setting .
2. Linear distance on the screen from the centre of the pattern to the second minima is given by setting .

Chapter 46 – Polarization

4. (a) At what angle of incidence will the light reflected from water be completely polarized?

(b) Does this angle depend on the wavelength of the light?

Answer:

1. For water,
2. Yes, the angle does depend upon the wavelength, as is a function of .

5. Calculate the range of polarizing angles for white light, incident on fused quartz. Assume that the wavelength limits are and and use this curve:



Answer:

From the figure, we note that the indices range from to for the white light. The corresponding polarizing angles are:

and