PHYSICS

BOOKS - NN GHOSH PHYSICS (HINGLISH)

DIFFRACTION

Example

1. Light from a narrow slit falls on a straight edge at a distance of 0.5 m from the slit. If the

diffracted is observed on a screen 0.75 m away from the edge, calculate the distance between the first and fourth dark band. $(\lambda = 6000\text{Å})$

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2. A strong parallel beam of monochromatic light is incident on a thin plate with a small circular hole of diameter 10^{-3} m. if the screen be moved through a distance of 0.125 m from the first position when the centre is black to

the second similar position, what is the wavelength of light used ?

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3. A source of monochromatic light of wavelength 0.6 μm is placed at a distance 0.3 m from a narrow slit, the distance between consecutive maxima is found to be 0.15 m m on a screen 0.5 m from the slit. Calculate width of the slit.

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4. A plane monochromatic light wave with intensity I_0 falls normally on an opaque screen with a round aperture. What is the intensity of light I behind the screen at the point for which the aperture

(a) is equal to the first Fresnel zone, to the internal half of the first zone,

(b) was made equal to the first Fresnel zone and then half of it was closed (along the diameter) ?

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Exercise

1. A narrow slit illuminted by light of wavelength 0.64 μ is placed at a distance of 3 m from a straight edge. If the distance between the straight edge and the screen is 6 m calculate the ditance between the first and fourth dark bands.

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2. Light from a narrow source falls on a razor's edge at a distance of 20 cm from the source. Calculate the separation between the first and fourth maxima on a screen held 30 cm away from the edge. (Wavelength of light =6000 Å)

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3. A screen is placed at a distance of 1m from a narrow slit. Light of wavelength 0.5 micron is fallilng normally on the slit. If the first minima of the diffraction pattern is situated at 5 m m

from the central maximum, find the width of the slit.

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4. A lens whose focal length is 40 cm forms a Fraunhofer diffraction of 50 cm and the distance width 0.3 m m . The distance of the first dark band from the direct one is is 0.785 mm. calculate the wavelength of light.

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5. Plane monochromatic light with intensity I_0 falls normally on an opaque disc closing the first Fresnel zone for a point on the screen in front of the wave front. What would be the intensity I at the same point if (a) half of the disc along the diameter were removed, (b) half of the external half is removed along the the diameter ?

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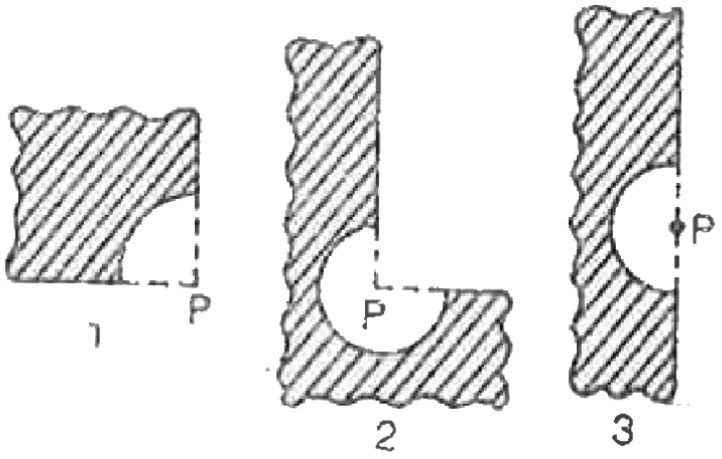
6. A plane monochromatic light wave of intensity I_0 falls normally on the surfaces of the opaque screens which are shaped as shown in the figure here. The shaped as shown in the gigure here. The rounded-off edge coinicides with the boundary of the first Fresnel zone. Find the intensity of the screens

at a point located behind the point P.



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7. Angular width of central maximum in the Fraunhofer diffraction pattern of a slit is measured. The slit is illuminated by another wavelengths, the angular width decreases by

30%. Calculate the wavelength of this light. The same decreases in angular width of central maximum is obtained when the original appertus is immersed in a liquid. find the refractive index of the liquid.

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