

JaganNath Gupta Institute of Engineering & Technology

Department of Physics

(2011-2012)

UNIT- III: DIFFRACTION OF LIGHT

Submission Date: 26-11-2011

ASSIGNMENT NO – 3

CATEGORY B

Students are advised to give the answers in explicit form of the following questions.

1. In Fraunhofer diffraction due to single slit, show that the intensity of first and second secondary maxima are roughly 4.5%, 1.6% respectively to that of the intensity of principal maxima. Draw the intensity distribution curve.
2. What happens in a Fraunhofer single slit diffraction, (a) if the width of slit is made equal to the wavelength of light, (b) if the slit width is gradually increased, (c) if the screen is gradually moved away from the slit?
3. Starting with the expression of intensity distribution due to plane transmission grating, (a) find the condition for principal minima and (b) show that there are (N-1) equally spaced minima between two adjacent maxima.
4. In a plane transmission grating, show that second order diffraction is not visible?
5. Show that resolving power of plane transmission diffraction grating does not depend upon the number of lines in a given width of ruled space.
6. Calculate the width of central maxima produced by plane diffraction grating.
7. The Width of slit is 0.012mm. Monochromatic light is incident on it. The angular position of first bright line is 5.2° . Calculate the wavelength of incident light. **(2010)**
8. Sodium light consists of two lines of wavelength 5890\AA and 5896\AA . Find the minimum number of lines that a grating must have in a order to resolve their wavelength in first order. **(2010)**
9. What is the highest order of spectrum which maybe seen with monochromatic light of wavelength 6000\AA by means of a diffraction grating 5000 lines/cm. **(2010)**
10. Calculate the minimum number of lines per cm in a 2.5cm wide grating, which will just resolve the sodium lines (5890\AA and 5896\AA) in the second order spectrum. **(2010)**
11. A grating has 9600 lines uniformly spaced over a width of 3cm and illuminated by light from mercury lamp. Find (i) dispersion in the third order in the vicinity of green line of wavelength 5460\AA , (ii) resolving power of grating in fifth order. **(2008)**
12. What must be the minimum number of lines per cm in half inch width grating to resolve the wavelengths 5896\AA and 5890\AA of sodium in first order. **(2008)**
13. A grating is made of 200 wires per cm are placed at equal distance. Diameter of each wire is 0.025mm. Calculate the angle of diffraction of the third order spectrum and also find the absent spectra, if any. Wavelength of light is 6000\AA . **(2008)**
14. Monochromatic light of wavelength 6.56×10^{-7} m falls normally on a grating 2cm wide. First order spectrum is produced at an angle of $18^\circ 15'$ minute from the normal. Deduce the total number of lines on the grating. **(2008)**