ACRHEM – Laser Primer

Assignment 5 **21-09-09**

Submission by October 6

1. Derive the ABCD matrix for free space and a thin lens. Take refractive index as a parameter in both the cases.

2. A Plane wave falls on the flat side of an plano convex lens. Derive the expression for the electric field after the lens?

3. A He-Ne laser has a beam waist of 1mm. Calculate the spot size at a distance of (a) 10mm,(b) 10cm, (a) 10km, from the beam waist.

4. A telescope with lenses *f1* and *f2* separated by a distance f1+ f2. It is positioned at z=0. Derive an expression for beam width after the telescope.

5. Plot $H(v) = \frac{1}{(v^2+a^2)}$ for different values of a.

6. $Q(h) = \frac{h}{(h^2+a^2)}$ for different values of a.

7. Derive a relation between W (z) and R (z).

8. Where does the beam waist of any laser lie – inside or outside the cavity. What experiment you will perform to determine its position?

9. A G beam is used in a Michelson Interferometer. Derive the expression for the interference pattern.

10. Find out about the amplitude and area version of a Gaussian.