1. **Young's experiment is performed with orange light from a krypton arc ($\lambda = 605.78\text{nm}$). If the fringes are measured with a micrometer eyepiece at a distance 100cm from the double slits, it is found that 25 of them occupy a distance of 12.87mm between centers. Find the distance between the centers of the two slits.** (5%)  

2. **If the mirror of a Michelson interferometer is moved 1.0mm, how many fringes of the blue cadmium line ($\lambda = 479.99\text{nm}$) will be counted crossing the field of view?** (5%)  

3. **The method of coincidences of Fabry-Perot rings is used to compare two wavelengths, one of which is 546.074nm, and the other slightly shorter. If coincidences occur at plate separations of 0.652, 1.827, and 3.002mm, find the wavelength of $\lambda'$.** (5%)  

4. **Parallel light of wavelength 656.3nm is incidence normally on a slit 0.385mm wide. A lens with a focal length of 50cm is located just behind the slit bringing the diffraction pattern to focus on a white screen. Find the distance from the center of the principle maximum to (a) the first minimum and (b) the fifth minimum.** (10%)  

5. **Find the diameter of the Airy disk in the focal plane of a refracting telescope having an objective with a focal length of 1m and a diameter of 10cm. Assume the effective wavelength is 5.5x10^{-6}\text{cm}.** (5%)  

6. **Light of two wavelengths, $\lambda = 560\text{nm}$ and $\lambda = 565\text{nm}$, fall normally on a plane transmission grating having 2500 lines per centimeter. The emerging parallel light is focused on a flat screen by a lens of 120cm focal length. Find the distance on the screen in centimeter between the two spectrum lines in the second order.** (5%)  

7. **Find a Jones’ vector $E_1$ representing a polarization state orthogonal to $E_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$. Sketch both of these.** (5%)  

8. **A straight hollow pipe exactly 1.25m long, with glass plate 8.5mm thick to close the two ends, is thoroughly evacuated. A ray of light in air enters the left glass plate making 5° with the normal. Traveling through the pipe, the ray is refracted into the right glass plate, then refracted again into air beyond. (a) If the glass plate have a refractive index of 1.525, find the overall optical path between the two outer glass surfaces. (b) By how much is the optical path increased if the pipe is filled with water of refractive index 1.333.** (10%)  

9. **A ray of light in air enters the center of one face of a prism at an angle making 55° with the normal. Traveling through the glass, the ray is again refracted into the air beyond. Assume the angle between the two prism faces to be 60° and the glass to have a refractive index of 1.65. Find the total deviation of the ray graphically.** (5%)  

10. **A thin equiconvex lens of index 1.53 and radii of 16cm is silvered on one side. Find the (a) focal length and (b) power of this system if light enters the unsilvered side.** (10%)  

11. **A thin lens with an aperture of 6cm and focal length of -10cm is located 4cm behind another thin lens with an aperture of 8cm and a focal length of 5cm. An object 4cm high is located 12cm in front of the first lens, and a stop 5cm in diameter is located midway between the lenses. Calculate (a) the size and position of the entrance pupil (b) the size and position of the exit pupil, and (c) the size and position of the final image. (d) Draw the marginal ray and the chief ray to find the size and position of the final image.** (35%)