# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

THIRD SEMESTER – November 2009

**PH 3500 - OPTICS**

Date & Time: 16/11/2009 / 1:00 - 4:00     Dept. No.                    Max. : 100 Marks

## PART – A

**Answer ALL questions.  All questions carry equal marks.          (10 x 2 = 20 marks)**

1. Write down translation and refraction matrix.

2. What is curvature of the field?

3. Green light of wavelength 5100 $\overset{o}{A}$ from a narrow slit is incident on a double slit.  If the overall separation of 10 fringes on a screen 200 cm away is 2 cm.  Find the slit separation.

4. How optical planeness of a glass plate is tested?

5. Define Dispersive power.

6. Distinguish between Fresnel and Fraunhoffer diffraction.

7. State Brewster's law.

8. A quarterwave plate of thickness 14.7 x 10$^{-6}$ m produces ordinary and extra ordinary ray.  Find the wavelength of light used $(\mu_0 = 1.53$ and $\mu_e = 1.54)$.

9. What is optical pumping?

10. Explain Stimulated Raman Scattering.

## PART – B

**Answer any FOUR questions.                              (4 x 7.5 = 30 marks)**

11. Describe the Construction and working of a Ramsden eyepiece.

12. Describe Fresnel's biprism.  Explain how the wavelength of light can be determined with its help.

13. Explain Rayleigh criteria for resolution and determine the resolving power of prism.

14. Describe the construction and use of a half-shade polarimeter to measure the specific rotatory power.

15. Define Einstein's Coefficients and derive an expression connecting them.

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## PART – C

**Answer any FOUR questions.**                                    **(4 x 12.5 = 50 marks)**

16. **Explain Chromatic aberration in lenses.  How can it be eliminated?**

17. **Describe Newton's rings experiment and explain how it is used to determine the wavelength and refractive index of a liquid.**

18. **a) Discuss Fraunhoffer diffraction pattern due to single slit.**                    **(9 marks)**

    **b) Calculate the minimum thickness of the base of a prism which will just resolve $D_1$ and $D_2$ lines of sodium. The refractive index of glass is 1.6545 for $\lambda$ = 6563 $\overset{o}{A}$ and 1.6635 for $\lambda$ = 5270 $\overset{o}{A}$ (wavelength of $D_1$ and $D_2$ lines are 5890 $\overset{o}{A}$ and 5896 $\overset{o}{A}$ respectively).**                    **(3.5 marks)**

19. **Describe how, with the help of a Nicol prism and a quarter waveplate, plane polarized light, circularly polarized light and elliptically polarized light are produced and detected.**

20. **With a neat sketch, describe the construction, principle and working of Ruby laser.**

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