

## B.Sc. (Part I) Examination

## PHYSICS

## Paper—III

## (Optics and Laser)

Time—Three Hours]

[Maximum Marks—40

**Note :—** (1) All questions are compulsory and carry equal marks.

(2) Draw neat diagram wherever necessary.

**EITHER**

1. (a) State Fermat's principle of extremum path. 2
- (b) Calculate the power of combination of two thin lenses of focal length  $f_1$  and  $f_2$  separated by the distance 'a'. 2
- (c) Deduce the relation :

$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$$

for refraction at a convex spherical surface for virtual image. 4

**OR**

2. (p) Name different types of monochromatic aberrations and explain the spherical aberration. 4
- (q) What is chromatic aberration ? How it can be reduced ? 4

**EITHER**

3. (a) Obtain an expression for the interference in thin films due to reflected light. 4

(b) Explain the necessity of a broad source to observe the interference in thin films. 2

(c) Explain the formation of Newton's rings. 2

**OR**

4. (p) Explain how the Michelson's Interferometer is used to measure the wavelength of sodium light. 3

(q) Calculate the distance between the two successive position of a movable mirror of a Michelson's Interferometer giving distinct fringes in the case of sodium light having wavelengths 5890 Å and 5896 Å. 2

(r) How the Newton's rings can be used to determine the refractive index of liquid ? 3

**EITHER**

5. (a) Explain the Fraunhofer diffraction due to single slit. 5

(b) Derive an expression for resolving power of microscope. 3

**OR**

6. (p) Explain :

(i) Fraunhofer's diffraction

(ii) Fresnel's diffraction. 3

(q) Define resolving power and obtain an expression for the resolving power of telescope. 5

**EITHER**

7. (a) Give the theory of plane transmission grating. 3

NEO—1575

2

(Contd.)

(b) Derive an expression for the resolving power of a plane transmission grating. 3

(c) Calculate the minimum number of lines in the grating which will just resolve the sodium lines in the first order spectrum. The wavelengths are 5896 Å and 5890 Å. 2

**OR**

8. (p) Describe the polarisation by double refraction. 3

(q) How Nicol can be used as a polariser and an analyser ? 3

(r) Show that a grating with 5000 lines per centimeter cannot give a spectrum in the 4<sup>th</sup> or higher order for light of wavelength 5890 Å. 2

**EITHER**

9. (a) Define spontaneous and stimulated emission. 2

(b) Describe the construction and working of Helium-Neon laser. 4

(c) State the chemical applications of laser. 2

**OR**

10. (p) Explain the four level laser system. 3

(q) What is meant by population inversion ? 2

(r) Explain the essential parts of the laser system. 3

NEO—1575

3

1350