B.Sc. (Part I) Examination

PHYSICS

Paper—III

(Optics and Laser)

Time—Three Hours] [Max. Marks—40

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

(2) Draw neat diagram wherever necessary.

EITHER

1. (a) Explain Fermat's principle. 2

(b) Prove that :

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

when refraction takes place at a concave surface. 4

(c) What is lens ? State its types. 2

OR

2. (p) Define power of a lens. State its unit. 2

(q) Find the focal length of plano-convex lens having the radius of curved surface 10 cm and refractive index 1·52. 2

(r) Prove that in case of a thin convex lens

$$\frac{1}{v}-\frac{1}{u}=(\mu-1)\left[\frac{1}{R_1}-\frac{1}{R_2}\right]$$ 4

EITHER

3. (a) State the principle of superposition of light. 1

(b) Draw a neat ray diagram of Newton's rings and derive an expression for the diameter of the bright or dark ring. 4

(c) Newton's rings are observed in reflected light of wavelength $5{\cdot}9\times10^{-7}$ m. The diameter of the 10^{th} dark ring is 0·5 cm. Find the radius of curvature of lens and the thickness of the air film. 3

OR

4. (p) Give the theory and working of Michelson's Interferometer. 6

(q) When the movable mirror of the interferometer is shifted through 0·0589 mm, 200 fringes move across the field. Calculate the wavelength of light used. 2

EITHER

5. (a) Define 'diffraction'. 1

(b) Explain Fresnel's half period zone. 3

(c) Derive an expression for area of half period zone. 4

OR

6. (p) Explain Rayleigh's criteria of resolution. 2

(q) Distinguish between Fresnel and Fraunhofer type of diffraction. 2

(r) Obtain an expression for the resolving power of telescope. 4

EITHER

7. (a) What is plane transmission grating ? 1

(b) How the plane transmission grating can be used in laboratory to determine the wavelength of light ? 4

(c) State and explain Brewster's law. 3

OR

8. (p) Give the construction and working of Nicol's prism. 4

(q) Give the theory of production of circularly and elliptically polarised light. 4

EITHER

9. (a) What do you mean by LASER ? 1

(b) Explain the difference between spontaneous and stimulated emission. 3

(c) Describe the construction and working of RUBY laser. 4

OR

10. (p) Explain :

(i) Optical pumping.

(ii) Population Inversion. 3

(q) Explain the three level laser system. 3

(r) State any four applications of Laser. 2