

Optics and Laser

P. Pages : 4

Time : Three Hours

Max. Marks : 40

- Note : 1. All questions are compulsory and carry equal marks.
2. Draw the neat diagram wherever necessary.

EITHER

1. a) Explain the Fermat's principle of extremum path. **2**
- b) Show that, in case of refraction at convex surface for real image of real object,
- $$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R} \quad \mathbf{4}$$
- c) Define power of lens state its unit. **2**

OR

2. p) Explain spherical aberration due to convex Lens. **2**
- q) Explain chromatic aberration. **3**

- r) Find the condition for achromatic combination of two lenses of same material having focal length f_1 and f_2 and separated by the distance from each other. 3

EITHER

3. a) Explain the function of compensating glass plate in Michelson's Interferometer. 2
- b) Find the expression for wave length of monochromatic light used in the michelson interferometer. 3
- c) In moving one mirror in michelson interferometer through a distance 0.1474mm, 500 fringes cross the centre field of view. Find the wavelength of light used. 3

OR

4. p) Define Interference of light. 1
- q) Derive the expression for diameter of nth dark Newton's ring. 4
- r) Why the center of Newtons ring is always dark. 1
- s) State the principle of working of Michelson interferometer. 2

EITHER

5. a) Distinguish between Fresnel and Fraunhofer diffraction. 2
- b) Explain Fresnel diffraction due to straight edge. 4
- c) What is half period zone ? 2

OR

6. p) What is diffraction of light ? 2
- q) Explain Fraunhofer diffraction due to single slit. 4
- r) State Rayleigh's Criterion for resolution. 2

EITHER

7. a) What is meant by plane transmission grating ? How it is constructed ? 2
- b) Deduce an expression for the resolving power of plane transmission grating. 3
- c) A parallel beam of Sodium light is incident normally on a plane transmission grating of 6000 line/cm. Calculate the wavelength of light used, if the angle of diffraction for Second order is 45° . 3

OR

8. p) What is plane polarised light ? 1
q) State and Prove Brewster's law. 3
r) How the Nicol prism used as a polariser ? 2
s) What is Quarter wave plate ? 2

EITHER

9. a) What is population inversion ? 2
b) Explain construction and working of Ruby laser. 4
c) State four applications of laser in medical field. 2

OR

10. p) Explain stimulated emission. 2
q) What is pulse laser ? 2
r) Describe the construction and working of He-Ne laser. 4
