

(DPHY 21)

M.Sc. (Final) DEGREE EXAMINATION, JUNE 2010.

Second Year

Physics

Paper V — ELECTROMAGNETIC THEORY AND
MODERN OPTICS

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Discuss the boundary conditions for dielectric reflection and refraction.
(b) Explain how polarization is achieved by reflection and refraction.
2. Explain the theory of dispersion and discuss the experimental demonstration of anomalous dispersion.
3. (a) Discuss the salient features of laser light. Obtain the relation between the coherence of the field and the size of the source.
(b) Explain the term “population inversion” and mention different methods to attain population inversion.

4. What are different types of lasers? Explain the construction and working of Ruby laser.
5. Explain the basic characteristics of hologram. Distinguish between hologram and photograph.
6. (a) Explain the structure of step index fiber. Write down its waveguide equations.
(b) Distinguish between step index and graded index fiber structures.
7. What are the different fiber materials and describe how the optical fibers are fabricated.
8. Discuss the various attenuation mechanisms that are responsible for the transmission losses in optical fibers.
9. Write a short note on any TWO of the following:
 - (a) Threshold condition.
 - (b) Applications of laser.
 - (c) Total internal reflection.
 - (d) Ray optics representation in optical fiber.