18. (a) Describe the modal analysis for a step index fiber.

Or

(b) Derive the fractional modal in the core of the fiber.

19. (a) Describe the experimental setup used to mode-lock a He-Ne laser.

Or

(b) Describe the giant pulse lasers and hence derive the peak power output.

20. (a) Describe the applications of holography in the field of microscopy and vibration analysis.

Or

(b) Describe the process of recording and reconstructing of the amplitude and phase of an optical wave.

———————

Reg. No. : .....

Code No. : 7126 **Sub. Code : C 43 P**

M.Sc.(CBCS) DEGREE EXAMINATION, APRIL 2013.

Fourth Semester

Physics— Main

OPTO ELECTRONICS AND LASERS

(For those who joined in July 2008-2011 onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

1. Write down the Maxwell's equations in differential form.

2. What is a resonant cavity?

3. What is a symmetric waveguide?

4. What is an asymmetric planar waveguides?

5. What is material dispersion?

6. What do you mean by multimode fiber?

7. Why two-level system is not appropriate for laser production?

8. What is the threshold pump power?

9. What is rainbow hologram?

10. What is holography?

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Explain the Lorentz theory of dispersion.

Or

(b) Discuss the phenomenon of total internal reflection.

12. (a) Describe the classification of modes for a planar waveguide.

Or

(b) Explain the phenomenon of coupling to waveguide.

13. (a) Explain the numerical aperture of the fiber.

Or

(b) Explain the Gaussian approximation for the fundamental mode of the step index fiber.

14. (a) Explain the methods of Q-switching.

Or

(b) Explain the effect of homogeneous or inhomogeneous broadening on the laser oscillation.

15. (a) Explain the Fraunhofer hologram.

Or

(b) Explain the minimum reference angle of the reconstruction geometry.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Give an account of electromagnetic theory of dispersion.

Or

(b) Discuss in detail the theory of a rectangular cavity resonator.

17. (a) Derive the power associated with TE mode of an asymmetric planar waveguide.

Or

(b) Describe the classification of modes for a planar waveguide.