

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.  
(For candidates admitted during the academic year 2004-05 & thereafter)

SUBJECT CODE : **PH/MO/LP34**

**B.Sc. DEGREE EXAMINATION NOVEMBER 2007**  
BRANCH III - PHYSICS  
THIRD SEMESTER

COURSE : **MAJOR – OPTIONAL**  
PAPER : **LASER PHYSICS**  
TIME : **3 HOURS**

MAX. MARKS : **100**

**SECTION – A**

ANSWER ALL QUESTIONS: ( 10 x 3 = 30 )

1. What are single mode and multimode fibres?
2. Explain what is population inversion.
3. Give the principle of an optical resonator.
4. What is Ruby Laser made of?
5. Explain the term spiking in Lasers.
6. Write down the chemiluminiscent reaction involved in CO laser.
7. What is an injection laser?
8. Outline the principle of Laser printing.
9. Explain the role of laser in controlled nuclear fusion.
10. Write note on isotope separation using Lasers.

**SECTION – B**

ANSWER ANY SIX QUESTIONS: ( 6 x 5 = 30 )

11. Explain the various pumping methods involved in lasers.
12. Gallium arsenide has activation energy of 1.4eV. Calculate the wavelength of the emitted photons. ( $h = 6.6 \times 10^{-34}$  Js,  $e = 1.6 \times 10^{-19}$  C,  $c = 3 \times 10^8$  m/s).
13. Explain the construction and functioning of He – Ne laser.
14. With energy level diagram, explain the working of Nd laser.
15. Obtain the condition for semiconductor laser action.

16. Write down the chemical reaction involved in HCL laser and briefly explain the laser action.
17. Outline the principle of Lidar and its application.
18. Write brief note on CD and optical computer.

**SECTION – C**

ANSWER ANY TWO QUESTIONS:

( 2 x 20 = 40 )

19. Obtain the Schawlow – Townes condition for laser oscillations.
20.
  - a) Explain the fundamental modes of vibration of CO<sub>2</sub> molecule and the laser action with energy level diagram.
  - b) Outline the principle of a dye laser and explain how tuning of laser radiation wavelength is accomplished.
21. Explain principle of holography and describe the methods for recording of hologram and reconstructing the image.
22. Discuss the applications of laser in
  - a) medicine
  - b) defence
  - c) industry and
  - d) communication.

