

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2019 – 2020 and thereafter)
SUBJECT CODE:19PH/ME/LP45
B.Sc. DEGREE EXAMINATION APRIL 2023
BRANCH III - PHYSICS
SIXTH SEMESTER

COURSE : MAJOR – ELECTIVE
PAPER : LASER PHYSICS
TIME : 3 HOURS

MAX. MARKS : 100

SECTION - A

ANSWER ALL QUESTIONS: (10 x 3 =30)

1. What is population inversion in LASER?
2. Write the conditions required for stimulated emission of radiations.
3. Define active medium in LASER. Name two active mediums used each in solid state and gas lasers respectively.
4. Write any two applications of He-Ne laser.
5. Explain the chemical reaction taking place in HCl chemical laser.
6. List the advantages of liquid (dye) lasers.
7. Differentiate intrinsic and extrinsic semiconductors.
8. How is the condition for laser action achieved in semiconductor lasers?
9. List any three applications of LIDAR.
10. Outline the use of lasers in communication.

SECTION - B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

11. Explain the following terms in laser.
(a) Spontaneous absorption
(b) Spontaneous emission
(c) Stimulated emission
12. The ratio of population of two energy levels out of which the upper one corresponds to a metastable state is 1.059×10^{-30} . Find the wavelength of light emitted at temperature $T = 330$ K.
13. A laser beam has a power of 100 mW. It has an aperture of 5×10^{-3} m and emits a light of wavelength 6943 Å. The beam is focused with a lens of focal length 0.1 m. Calculate the area and intensity of the image.
14. Illustrate the working of HF chemical laser.
15. Describe the working of a Diode Laser.
16. What is LIDAR? Summarize the working of LIDAR.
17. Explain the use of laser in cancer therapy and eye surgery.

SECTION - C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

18. (i) Explain briefly the various pumping methods used to produce population inversion.
(ii) Write the applications of holography.
19. Describe the construction and working of Nd:YAG laser using neat structure and energy level diagrams.
20. Write in detail the construction and operation of CO₂ laser using neat schematics of structure and energy levels.
21. Give detailed explanation on the application of lasers in drilling, cutting and welding.