

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.**  
**(For candidates admitted during the academic year 2015 – 2016 and thereafter)**

**SUBJECT CODE:15PH/ME/LP55**

**B.Sc. DEGREE EXAMINATION NOVEMBER 2018**  
**BRANCH III - PHYSICS**  
**FIFTH SEMESTER**

**COURSE : MAJOR – ELECTIVE**  
**PAPER : LASER PHYSICS**  
**TIME : 3 HOURS** **MAX. MARKS : 100**

**SECTION - A**

**ANSWER ALL QUESTIONS: (10x3=30)**

1. What is stimulated absorption and stimulated emission?
2. Discuss various pumping methods used in the Lasers for obtaining population inversion.
3. Why a three level laser normally provides pulsed output?
4. Why we prefer four level laser over three level laser even if its efficiency is low.
5. What are chemical laser? Give its advantage.
6. What are the roles played by N<sub>2</sub> and He in CO<sub>2</sub> laser?
7. What is the principle of Semi-Conductor Laser.
8. Define the term Holography.
9. Mention the applications of laser in medical field.
10. Write short notes on laser welding.

**SECTION – B**

**ANSWER ANY FIVE QUESTIONS: (5x5=25)**

11. In a Laser, the total number of lasing particles (ions, electrons, holes etc.) are  $2.8 \times 10^{19}$ , If the Laser emits radiation of wavelength  $7000 \text{ \AA}$ , then calculate the energy of one emitted photon and total energy available per pulse. Assume the efficiency of Laser to be 100%.
12. For a Cavity volume =  $1\text{cm}^3$ , calculate the number of modes that fall within a bandwidth  $\Delta\lambda = 10 \text{ nm}$  centered at  $\lambda = 600\text{nm}$ .
13. What is Optical resonator? Explain any two types of optical resonator.
14. Define the term Coherence. What do you mean by spatial and temporal coherence?
15. Explain the construction and working of chemical laser with energy level diagram.
16. Explain Recording and reconstruction of the image using holography.
17. List out the applications of lasers in nuclear physics.

**SECTION – C**

**ANSWER ANY THREE QUESTIONS: (3x15=45)**

18. Derive Einstein's relation for stimulated emission.
19. Describe the construction and working of Nd.YAG laser.
20. Explain the modes of vibration of CO<sub>2</sub> molecule. Describe the construction and working of CO<sub>2</sub> laser with necessary diagrams.
21. Describe the construction and working of hetero – junction semiconductor laser.

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