C 80723

16

(Pages : 2)

Name.....

Reg. No.....

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, MARCH 2020

(CUCSS)

Physics

PHY 4E 13—LASER SYSTEMS, OPTICAL FIBRES AND APPLICATIONS

(2017 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries weightage 1.

1. It is not possible to establish steady state population inversion by optical pumping between just two levels. Why ?

2. What are resonators ? Why are they needed in a Laser system ?

3. Distinguish between Q-switching and mode locking.

4. Describe the pumping in Ruby laser. Describe the energy levels of Chromium ions in the Ruby laser.

5. What are the modes of vibrations of carbon dioxide molecule ? Why efficiency of carbon dioxide laser is high ?

6. What is non linear polarization ?

7. Illustrate multiphoton absorption in the context of photoelectric effect.

8. Describe any two applications of laser in chemistry.

9. What are the applications of holography ?

10. Describe photochemical separation of isotopes using lasers.

11. Describe the structure of graded index fibre. Describe one of its advantage.

12. Describe the advantages of communication through the optical fibre.

(12 × 1 = 12 weightage)

Turn over

Section B

Answer any **two** *questions.*
Each question carries weightage 6.

18. Examine Light amplification in Lasers. How does the intensity of radiation changes as it pass through the medium ? Derive the equation for the threshold population inversion. State conditions for a low threshold value of population inversion.

14. Describe the working principle and energy level diagrams of (a) Nd : YAG laser and (b) He-Laser.

15. Describe the theory of generation of second and third harmonics.

16. Describe in detail the technique of spatial frequency filtering. Discuss its applications.

(2 × 6 = 12 weigh

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

17. Compute the natural line width of sodium D_1 line. Given : the spontaneous life time of the rele sodium level is 16ns. If the actual line width is 10^9 Hz, compute the line shape function.

18. Derive the equation for threshold intensity in the case of parametric oscillations. Show th achieve parametric amplification, for a given change in propagation constant, there is a mini value of pump intensity.

19. Discuss Z-scan technique in detail.

20. Describe laser induced fusion.

21. A multimode step index fiber has a core diameter 80μm and a relative index difference of 1.5 is operating at a wave length of 0.85μm. If the core refractive index is 1.48. Calculate the norma frequency of the fiber.

22. Describe the scale wave equation of a fiber. Discuss on the modes in a fiber.

(4 × 3 = 12 weigh