St. Joseph's College of Arts & Science (Autonomous)
Cuddalore – 607001
PG & RESEARCH DEPARTMENT OF PHYSICS

SUBJECT : LASER & FIBER OPTICCOMMUNICATION

SUBJECT CODE: PH612S

SUBJECT INCHARGE: Mr. M.Sathish (shift-I)
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SECTION – A

1. State Einstein coefficients.

2. What are Optical Resonators?

3. What is mode locking?

4. Give the applications of Laser in Medical field.

5. List the advantages of Holography.

6. What is reconstruction of Hologram?

7. Define acceptance angle.

8. Give the classification of fiber.

9. State the principle of optical detection.

10. List the advantages of optical fibers.

11. State the principle of Laser.

1 2. What is population inversion.

1 3. Define Q-switching.

1 4. Give any four Applications of Lasers.

1 5. Give any four applications of Laser.

1 6. Draw the energy level diagram of Ruby laser.

1 7. What are optical fibers?

1 8. Define numerical aperture.

19. Mention of function of photo detectors.

20. Define Noise.

21. What is Laser?

22. Define population inversion.

23. Give shortnotes on CO2 laser.

24. Give any two types of solid state lasers.

25. List the difference between holography and photography.

26. Give the medical applications of laser.

27. Classify the optical fibers.

28. What is meant by mutimode fiber?

29. Give two sources of fiber optic communication.

30. List out the optical detectors.

31. What are the properties of laser?

32. What are the conditions needed for laser action?

33. What is a gas laser?

34. What is Q – switching?

35. What is hologram?

36. Mention any two application of laser in industry?

37. What is the basic principle of fiber optics?

38. What is meant by graded – index fiber?

39. Mention any two advantages of optical fibers in communication over ordinary cable communication.

40. What are the basic principle of optical detection?

41. What do you mean by stimulated emission of radiation?

42. What do you mean by population inversion in connection with laser?

43. What are the different types of laser?

44. Explain the term Q-switching?

45. What is meant by holography?

46. Name two uses of Laser beams in medical field?

47. Define acceptance angle.

48. Define step-index fibre?

49. What is modulation?

50. What is photo detector?

51. List the properties of LASER.

52. Define threshold condition.

53. Give a principle of semiconductor laser.

54. What is mode locking?

55. Explain laser welding.

56. List the applications of holography.

57. Define critical angle.

58. What are the losses in fibers?

59. Explain LED.

60. Define modulation.

5 Mark

1. a) Give the principle of laser. Explain the condition for light ampplification. (or)

    b) Write a short notes on population inversion and threshold condition.

2. a) Explain the working of semiconductor laser.   (or)

    b) Describe Q-switching and Mode locking.

3. a) Explain the drilling and surface hardening using lasers. (or)

    b) Describe the theory of recording the Hologram.

4. a) Explain the propagation of light through optical fiber. (or)

    b) Distinguish between step-index fiber and Graded index fiber

5. a) Explain Analog modulation with suitable diagram. (or)

    b) Describe pin photo detectors with neat diagram.

6. a) Obtain the relation between the Einstein coefficient. (or)

   b) Explain optical resonators.

7. a) Describe the working of Ruby laser with suitable diagrams. (or)

    b) Explain the working of Heterojunction lasers.

8. a) Discuss the applications of laser in industry.   (or)

   b) Explain the theory of reconstructions of Holography.

9. a) Describe the principle of optical fiber. (or)

   b) Distinguish between single mode fibre and multimode fiber.

10. a) Write short notes on source and detectors for fiber optic communication. (or)

    b) Explain APD photo detectors with suitable diagram

11. a) Give the Threshold condition for laser? (or)

    b) Derive Einstein's relation

12. a) Write the advantages of Nd- YAG laser. (or)

    b) Define- Q switching and mode locking.

13. a) Describe surface hardening. (or)

 b) What is hologram? Give any two applications.

14. a) Define acceptance angle and numerical aperture. (or)

    b) Define step index and graded index fibre.

15. a) Write the Advantages of using LED as an optical detector. (or)

    b) Give short notes on pin photodetectors.

16. a) Obtain the threshold condition for laser oscillation.   (or)

    b) Explain the various types of pumping for achieving the condition of Population
inversion?

 17. a) Explain the working of semiconductor Laser.   (or)

b) A He – Ne laser emits light at a wavelength of 632.8 nm and has an output power of 2.3 mW. How many photons are emitted in each minute by this laser when operating?

18. a) Explain how lasers are used in cutting drilling and welding operations in industry. (or)

   b) Write down the various applications of holography.

19. a) Find the numerical aperture, the acceptance angle for a step index fiber for which n1 = 1.48, n2 = 1.448 and n0 = 1. (or)

   b) Write notes on   i) Step index fiber and   ii) Graded index fiber

20. a) Explain the two types of modulator in Fiber optic communication system. (or)

   b) Explain pin and APD photodetectors.

21. a) Write a note on population inversion. (or)

   b) Discuss the role of optical resonators in lasers.

22. a) Describe the working of a heterojunction laser. (or)

   b) Write a note on the Excimer laser.

23. a) With necessary diagram explain laser cutting. (or)

   b) Give the medical applications of lasers.

24. a) List the properties of optical fibers. (or)

   b) Differentiate single mode and multimode fibers.

25. a) Differentiate analog and digital modulation methods. (or)

   b) Discuss the various sources used in fiber optic communication

26. a) Explain briefly Einstein's A and B coefficients? (or)

   b) Write short note on optical resonators?

27. a) Describe the single-heterojenction laser with a suitable diagram? (or)

   b) Write short note on Excimer Laser?

28. a) Explain the construction of a hologram? (or)

   b) Write note on laser cutting?

29. a) Write short note on the classification of optical fibre?(or)

   b) A step index fibre has a numerical aperture of 0.18, a core refractive index of 1.50 and a core diameter of 80um .Find a. The angle of acceptance b. The refractive index of the

cladding and c. The approximate maximum number of mode with a wavelength of 0.8m that the fibre can carry.

30. a) Describe briefly the working of APD photo detector? (or)

b) Explain digital modulation with suitable diagram.

10 Mark

1. Explain four level system in laser.

2. Describe the laser action in He - Ne laser with suitable energy level diagram.

3. Discuss the applications of laser in various field.

4. Classify the optical fibers based on the number of modes.

5. Explain digital optical fiber communication system with a block diagram.

6. Explain three level systems in laser.

7. Describe the laser action in COR2R laser with suitable energy level diagram.

8. Discuss the applications of holography in detail.

9. Write an essay about the fabrication techniques of fibers.

10. With a neat block diagram, explain the working of fibreoptic communication system.

11. Describe in detail about pumping, three level and four level systems of laser.

12. Explain He-Ne laser with energy level diagram.

13. Explain the application of laser in industrial field.

14. Explain fabrication techniques of fibers.

15. Derive Einstein's relation for stimulated emission and, hence explain the existence of stimulated emission.

16. Describe the construction and working of CO2 laser with a suitable energy level diagram.

17. i) What is the reason for using laser beam for the construction and reconstruction of a hologram.

ii) Explain recording of hologram and reconstruction process in holography.

18. Explain in detail about optical fibers and its modes?

19. Write an essay about the working of fiber optic communication system.

20. Describe working principle of optical detection

21. Derive the threshold condition for lasing action?

22. With the help of a neat and labeled energy level diagram,explain the lasing action of the He-Ne lasing system. When lasing action takes place among the levels of Ne, explain clear the role of He-atoms?

23. Give the theory and priniciple of construction of a point hologram?

24. What is numerical aperture? Derive the relation between acceptance angle and refractive indices?

25. Write an essay about the working of fibre optic communication system?

26. Derive the Einstein's coefficients for a laser system.

27. With a neat sketch discuss in detail the construction and working   of a He-Ne laser.

28. Explain the theory of recording and reconstruction of a holographic image.

29. Obtain the expression for the mode formation in step index fiber.

30. Describe in detail the construction and working of APD photodetector.