B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2025

SEMESTER 3 : PHYSICS

COURSE : **19U3CRPHY3 : OPTICS, LASER AND FIBER OPTICS**

(For Improvement/Supplementary 2023/2022/2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer any 8 (2 marks each)

1. Under what conditions may we observe circular fringes with a Michelson interferometer?
2. Identify the role of Helium in a He-Ne laser.
3. How may we construct a zone plate?
4. Identify four important application of holography.
5. Explain the principle of construction of Nicol prism.
6. What is Fraunhoffer diffraction?
7. What is meant by specific rotation?
8. What do you understand by plane of polarisation.
9. The Einstein Coefficient A_{12} is 0? True or False. Support your answer.
10. Explain the significance of Parallel plate resonator.

(2 x 8 = 16)

PART B
Answer any 6 (4 marks each)

11. Quartz has refractive indices of 1.553 and 1.544 for extra ordinary and ordinary lights. Calculate the thickness of quarter wave plate for sodium light of wavelength of 589nm.
12. Define refractive indices of (a) ordinary ray and (b) extra ordinary ray.
13. A fiber cable has an acceptance angle of 30^0 and a core index of refraction 1.4. Find out NA.
14. Demonstrate pictorially the paths of ordinary and extraordinary in a negative birefringent crystal.
15. Two coherent light sources are kept 180 microns apart and the fringes are observed on a screen 80 cm away. It is observed that with a certain monochromatic light, the fourth bright fringe is situated at a distance of 10.8 mm from the central fringe,. Calculate the wavelength of light.
16. Two coherent sources, whose intensity ratio is 16:4 produces interference fringes. Deduce the intensity ratio of maximum to minimum of the fringe system.
17. Find the ratio of populations of the two states in a He-Ne laser that produces light of wavelength 6328Å at 27^0C .
18. A fiber cable has an acceptance angle of 30^0 and a core index of refraction 1.4. Find out the refractive index of the cladding.

(4 x 6 = 24)

PART C
Answer any 2 (10 marks each)

19. Discuss the various methods used to achieve population inversion.
20. Explain the major components of a laser system. List major applications of laser.

21. What is a quarter wave plate? Explain its construction and use. How will you use it to produce elliptically and circularly polarized light.

22. With necessary theory describe how the diameter of a thin wire may be measured experimentally, with air wedge setup.

(10 x 2 = 20)