Reg. No ..... Name **22U323**

B. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022

SEMESTER 3 : PHYSICS

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

(For Regular - 2021 Admission and Improvement / Supplementary - 2020 / 2019 Admissions)

Time : Three Hours Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. State the conditions for sustained interference.
2. Outline the functions of optical resonator.
3. Using ray theory explain the mechanism of transmission of light within an optical fiber.
4. Illustrate the merits of semiconductor diode laser.
5. Why do we have a central dark spot in the case of a Newton's rings setup to be viewed from top (reflection) ?
6. Discuss the advantages and disadvantages of optical fiber over conventional communication transmission media.
7. Does it matter, if the mirrors used in the two arms of a Michelson interferometer are not flat?
8. What is meant by specific rotation?
9. What will happen to the visibility of fringes if we place water between glass plates in the case of a air wedge experiment?
10. State Malu's law.

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. Calculate the thickness of quarter wave plate for wavelength of 600nm when ordinary and extra ordinary rays have refractive indices of 1.55 and 1.44 respectively.
12. What are Polaroids? Give some of its uses.
13. When a thin sheet of transparent material of thickness 6.6 microns is introduced in the path of one of the interfering beams, the central fringe shifts to a position occupied by the sixth fringe. If the wavelength used is 546 nm, find the refractive index of the sheet.
14. Invent the wavelength at which the rates of spontaneous and stimulated emission become equal. Assume the temperature = 500K.
15. Two coherent sources, whose intensity ratio is 9:16 produces interference fringes. Deduce the intensity ratio of maximum to minimum of the fringe system.
16. Newton's rings are observed in reflected light of wavelength 550 nm. The diamater of the tenth dark ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.
17. Demonstrate pictorially the paths of ordinary and extraordinary in a positive birefringent crystal.
18. Calculate the least thickness of a calcite plate which would convert plane polarized light into circularly polarized light. Given refractive index of ordinary light = 1.658 and that for extra ordinary light 1.486 and wavelength of light is 589nm.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. What are thin films? Discuss setup for Newton's rings experiment and with necessary theory show that the rings are not evenly spaced.
20. Discuss the propagation of light through an optical fiber. Obtain the expressions for critical angle, acceptance angle, numerical aperture and fractional refractive index change.

21. What is a quarter wave plate? Explain how it can be used in producing elliptically and circularly polarized light.

22. Discuss the theory of production and detection of circularly polarized light.

(10 x 2 = 20)