Reg. No. : ....

Name : ....

III Semester B.Sc. Degree CBCSS (OBE) Reg./Sup./Imp. Examination, November 2021
(2019 – 2020 Admission)
COMPLEMENTARY ELECTIVE COURSE IN PHYSICS FOR BSC PROGRAMMES
3C03PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 32

PART – A

Short answer questions. Answer **all** questions. **Each** question carries **1** mark.

1. Give any two conditions for sustained interference of light waves.
2. What is the basic difference between Fresnel and Fraunhofer diffractions ?
3. What is Brewster's law ?
4. Give any two properties of laser beams.
5. What do you mean by holography ?

(5×1=5)

PART – B

Short essay questions. Answer **any 4** questions. **Each** question carries **2** marks.

6. Discuss the origin for the colors in thin films when it is illuminated with white light.
7. Discuss the basic steps involved in the determination of wavelength of light using transmission grating.
8. Explain the double refraction phenomenon.
9. Explain the processes induced absorption, spontaneous emission and stimulated emission.
10. Discuss the different applications of lasers.
11. Write short note on coherent bundle. Give an application of the same. (4×2=8)

P.T.O.

PART – C

Problems. Answer **any 3** questions. **Each** question carries **3** marks.

12. In Newton's rings experiment with reflected light, the diameter of 15th ring is 0.6 cm and that of 5th ring is 0.3 cm. If the radius of the plano-convex lens is 100 cm, determine the wavelength of light used.

13. Estimate the radius of the first zone in a zone plate of focal length 20 cm for light of wavelength 500 nm.

14. Two polarizing plates have polarizing directions parallel so as to transmit maximum intensity of light. Through which angle must either plate be turned so that the intensity of the transmitted beam is to drop by one third ?

15. Using a suitable figure, explain the working principle of a He-Ne laser.

16. The core and cladding refractive indices of a silica optical fibre are 1.5 and 1.4 respectively. Calculate the critical angle of reflection for the core-cladding interface. Also calculate the acceptance angle of the fiber.

(3×3=9)

PART – D

Long essay questions. Answer **any 2** questions. **Each** question carries **5** marks.

17. Discuss the general theory of formation of interference fringes. Write down the conditions for bright and dark fringes. Obtain an expression for the fringe width.

18. Discuss the Fraunhofer diffraction pattern due to a single slit. Draw the intensity distribution.

19. What is meant by a quarter wave plate ? With the help of a neat diagram, discuss the production of an elliptically and circularly polarized light using a quarter wave plate.

20. Write short note on :
    a) Principle of laser
    b) Metastable state
    c) Population inversion
    d) Pumping and pumping methods.

(2×5=10)