



K20U 1843

Reg. No. :

Name :

III Semester B.Sc. Degree CBCSS (OBE) – Regular
Examination, November 2020
(2019 Admission Only)
COMPLEMENTARY ELECTIVE COURSE IN PHYSICS
3C03PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 32

PART – A

Short answer questions. Answer **all** questions, **each** question carries **1** mark.

1. What are coherent sources of light ?
2. Give any one difference between a zone plate and a convex lens.
3. What is Malus's law ?
4. What do you mean by pumping in lasers ? Give a method of pumping.
5. What are fiber optic sensors ? (5×1=5)

PART – B

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

6. Explain the origin for the colours in thin films when it is illuminated with white light.
7. What do you mean by the term dispersive power of a grating ? Obtain an expression for the same.
8. Discuss the construction and features of a Nicol prism.
9. Discuss the basic parts of a fibre-optic communication system using a suitable diagram.
10. Discuss the light propagation mechanism in optical fibers.
11. Explain the basic properties of laser beams and its applications. (4×2=8)

P.T.O.



PART – C

Problems, answer **any 3** questions, **each** question carries **3** marks.

12. In Newton's rings experiment, the diameter of the m^{th} ring changes from 1.2 cm to 1 cm when the air space between the lens and the glass plate is replaced by a transparent liquid. Determine the refractive index of the liquid.
13. Calculate the radius of the second zone in a zone plate of focal length 10 cm for light of wavelength 500 nm.
14. Determine the thickness of a doubly refracting glass plate capable of producing a path difference of $\lambda/4$ between ordinary and extra ordinary waves. Given, the wavelength of light $\lambda = 5890 \text{ \AA}$, refractive index of the glass plate for ordinary ray = 1.54 and the refractive index of the glass plate for extra ordinary ray = 1.53.
15. Discuss the basic steps involved in holography.
16. A step index fiber has a core of refractive index 1.55 and cladding of refractive index 1.5. Determine the numerical aperture of the fiber. Assume that light enters the fibre from air. **(3×3=9)**

PART – D

Long essay questions, answer **any 2** questions, **each** question carries **5** marks.

17. Discuss the theory of interference in thin films caused by reflected light. Obtain the conditions for brightness and darkness.
18. Discuss the Fresnel diffraction at a straight edge. Obtain positions of maximum and minimum brightness.
19. Explain the double refraction phenomenon. Discuss Huygen's theory of double refraction in uniaxial crystals.
20. What is the basic principle of a laser indicating the essential parts? Using a suitable figure, explain the working principle of a He-Ne laser. **(2×5=10)**