



K23U 3443

Reg. No. :

Name :

III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/
Improvement) Examination, November 2023
(2019 to 2022 Admissions)

COMPLEMENTARY ELECTIVE COURSE IN PHYSICS FOR B.SC.
PROGRAMMES

3C03PHY : Optics and Photonics

Time : 3 Hours

Max. Marks : 32

PART – A

Short answer questions. Answer **all** questions. **Each** carries **one** mark.

1. What is meant by diffraction ?
2. Define the dispersive power of grating.
3. Briefly explain population inversion.
4. What do you mean by induced absorption ?
5. What is total internal reflection ?

(5×1=5)

PART – B

Short essay questions. Answer **any four** questions. **Each** carries **two** marks.

6. What are the conditions for sustained interference of light ?
7. Explain the phenomenon of colours of thin films.
8. Distinguish between Fresnel diffraction and Fraunhofer diffraction.
9. What is meant by double refraction ?
10. Discuss the advantages of fibre optic communication systems.
11. What is an angle of acceptance ?

(4×2=8)

P.T.O.

K23U 3443



PART – C

Problems. Answer **any three** questions. **Each** carries **three** marks.

12. A soap film of refractive index 1.33 is illuminated by a white light incident at an angle of 30° . The light reflected by it is examined by a spectroscope in which a dark band corresponding to the wavelength $5 \times 10^{-7} \text{m}$ is found. Calculate the smallest thickness of the film.
13. A diffraction pattern of a single slit of width $12 \mu\text{m}$ is formed by a lens of focal length 30 cm . Calculate the distance between the two dark bands on each side of the central bright band. Given $\lambda = 670 \text{ nm}$.
14. Calculate the thickness of a quarter-wave plate for a light of wavelength $6 \times 10^{-7} \text{ m}$. Principal refractive indices are $n_o = 1.544$ and $n_e = 1.553$.
15. Find the numerical aperture and angle of acceptance of an optical fibre having a core of refractive index 1.6 and a cladding of refractive index 1.50.
16. Find the ratio of the population of the two states in a He-Ne laser that produces light of wavelength $6328 \text{ \AA}$ at 27°C .

(3×3=9)

PART – D

Long essay. Answer **any two** questions. **Each** carries **five** marks.

17. Explain the formation of Newton's rings. Derive an expression for the radii of rings.
18. Discuss in detail Fraunhofer diffraction due to a single slit.
19. Describe the principle, construction and working of a Ruby laser.
20. Explain with the theory the production of circularly polarised and elliptically polarised light waves.

(2×5=10)