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)

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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 5×10^{-7} m is found. Calculate the smallest thickness of the film.

13. A diffraction pattern of a single slit of width 12 μm 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 $\lambda = 670$ nm.

14. Calculate the thickness of a quarter-wave plate for a light of wavelength 6×10^{-7} 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 Å at 27°C.

$(3 \times 3 = 9)$

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.

$(2 \times 5 = 10)$

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