

C 43201

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Name.....

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2023

Physics/Applied Physics

PHY 2C 02—OPTICS, LASER, ELECTRONICS

(2019—2022 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type)

Answer all questions in two or three sentences.

Each correct answer carries a maximum of 2 marks

1. What are the conditions for obtaining sustained interference ?
2. What is the origin for colors exhibited by thin films ?
3. What is diffraction? What is the condition for obtaining a noticeable diffraction effect ?
4. Mention two features of Fresnel diffraction.
5. In the Fraunhofer diffraction at a single slit, draw the intensity distribution.
6. Distinguish between transmission and reflection gratings. Give an expression for the principal maximum of order, say n , in the diffraction spectrum.
7. Write any two differences between interference and diffraction patterns.
8. What do you mean by double refraction ? Distinguish between positive and negative crystals.
9. What do you mean by a plane polarized light ? When a plane polarized light is passed through a polarizer, how many times will it be extinguished in one full rotation of the polarizer ?
10. What do you mean by a filter circuit ? Explain the construction of a π -section filter.
11. What do the Einstein's co-efficients stand for ?
12. List any three essential characteristics of spontaneous emission.

(Ceiling 20)

Turn over

Section B (Paragraph/Problem Type)

Answer **all** questions in a paragraph of about half a page to one page.

Each correct answer carries a maximum of 5 marks.

13. 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, what is the wavelength of light used in the experiment. ?
14. In Fraunhofer diffraction pattern due to a narrow slit, a screen is placed 2 m away from the lens to obtain the pattern. If the wavelength of light used is 5×10^{-5} cm and the first minimum lie at 5 mm on either side of the central maximum, what is the slit width ?
15. Using suitable figures, explain the term optical activity.
16. Calculate the minimum thickness of a calcite plate which would convert a plane polarized light to circularly polarized. Given, the wavelength of light $\lambda = 5890 \text{ \AA}$, refractive index of ordinary ray = 1.658 and the refractive index of extra ordinary ray = 1.486.
17. A transistor has $\alpha = 0.98$, $I_B = 100 \text{ \mu A}$ and $I_{CBO} = 5 \text{ \mu A}$. Determine emitter current, collector current and the amplification factor β .
18. Give the truth table of an exclusive OR gate. How will you construct it using basic gates ?
19. Give the construction and the basic details of a He-Ne laser.

(Ceiling 30)

Section C (Essay Type)

Essays.

Answer in about **two** pages.

Answer any one question.

Answer carries 10 marks.

20. Give the analytical treatment of interference of two sinusoidal waves. Discuss the conditions for maximum and minimum intensity. Plot the energy distribution as a function of phase angle.
21. Discuss the working principle of a centre-tapped full wave bridge rectifier using suitable figures. Obtain an expression for its efficiency.

(1 × 10 = 10 marks)