

D 103781

(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER (CBCSS-UG) DEGREE EXAMINATION
APRIL 2024**

Physics/Applied Physics

PHY 2C 02—OPTICS, LASER, ELECTRONICS

(2019—2023 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.
Ceiling 20.*

1. What are the conditions for two light sources to be coherent ?
2. Distinguish between the Newton's rings formed by reflected and transmitted monochromatic light.
3. For interference in thin films in the reflected system, write down the condition for constructive and destructive interferences.
4. Write any two differences between Interferences and Diffraction patterns.
5. What is diffraction ? Write down the condition for diffraction.
6. What do you mean by double refraction ? What do you mean by the optic axis of an anisotropic crystal ?
7. Explain the term optical activity. Give two examples of optically active substances.
8. Draw the current-voltage characteristics of a Zener diode. What is the use of a Zener diode ?
9. State the working principle of a transistor amplifier.
10. What are the basic requirements of an oscillator ?
11. What do you mean by population inversion ? Mention any two mechanisms to achieve population inversion.
12. Draw the energy level diagram showing the different transitions in a ruby laser.

(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.

Overall ceiling 30.

13. Light of wavelength $6000 \text{ \AA}$ from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen placed 100 cm. away is 1 cm., determine the fringe separation.
14. Newton's rings are formed with red light of wavelength 670 nm. The radius of the 20th ring is found to be $1.1 \times 10^{-2} \text{ m}$. Find the radius of curvature of the lens and the radius of the 30th ring.
15. Find the angular separation between the two sodium lines of wavelength 589 nm and 589.6 nm, when a parallel beam of light is incident on a plane transmission grating of 6×10^5 lines per meter in the second order spectrum.
16. Explain Brewster's law. Give two applications of Brewster's law.
17. A plane polarized light passes through a uniaxial crystal with its optic axis parallel to the faces. Determine the least thickness of the plate for which the emergent beam is plane-polarized. Given $\mu_e = 1.5533$, $\mu_o = 1.5442$ and $\lambda = 500 \text{ nm}$.
18. For a transistor circuit, the values of base current and emitter current are $50 \text{ }\mu\text{A}$, 2 mA , respectively. Find α and the collector current.
19. Explain the processes spontaneous emission, stimulated absorption and simulated emission using suitable figures.

(Ceiling 30)

Section C (Essay Type)

Answer any one question in about two pages.

The question carries 10 marks.

20. Discuss the Fraunhofer diffraction pattern due to a single slit. Draw the intensity distribution.
21. What are universal gates ? Give truth tables for NOR and NAND gates. Construct OR, AND and NOT gates using NOR and NAND gates.

(1 × 10 = 10 marks)