**D2BPH2302** (PAGES 2) **Reg.No**.....

**Name:** .....

**SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024**

**(Regular/Improvement/Supplementary)**

**PHYSICS: COMPLEMENTARY COURSE FOR CHEMISTRY & MATHEMATICS**

**GPHY2C02T: OPTICS, LASER AND ELECTRONICS**

**Time: 2 Hours** **Maximum Marks: 60**

**SECTION A: Answer the following questions. Each carries *two* marks.**

**(Ceiling 20 Marks)**

1. What are the conditions for the production of maxima and minima in interference pattern?
2. What are coherent sources? Give two examples.
3. Explain why the centre of Newton's rings is dark for reflected light.
4. What is meant by diffraction of light? What is the condition for it to take place?
5. Draw the intensity distribution curve in Fraunhofer single slit diffraction.
6. Define resolving power of a grating. Give its expression.
7. Compare the action of a zone plate with that of a convex lens.
8. What are positive and negative crystals? Give two examples for each.
9. Define specific rotation. What is its unit?
10. State and explain De Morgan's theorem.
11. Explain stimulated emission with a two level diagram.
12. What is meant by population inversion?

**SECTION B: Answer the following questions. Each carries *five* marks.**

**(Ceiling 30 Marks)**

13. White light falls perpendicularly upon a film of soapy water of refractive index 1.33 and thickness $5 \times 10^{-7}$ m. Which wavelength in the visible region will be reflected most strongly by the film?
14. A plano convex lens of radius of curvature 0.7m is placed on a plane glass plate and Newton's rings are observed using monochromatic light. If the $10^{th}$ dark ring has a radius of 2.03 mm, calculate the wavelength of the light.
15. Describe briefly the principle and construction of a quarter wave plate.

**(PTO)**

16. A plane polarised light is incident perpendicularly on a quartz plate cut with face parallel to optic axis. Find the thickness of quarter plate which introduces a phase difference of $45^0$ between e- and o- rays. Given, refractive index of the o- ray = 1.544, refractive index of the e-ray = 1.553 and wavelength of light = 5400 $A^0$.
17. Obtain relations between the current amplification factors $\alpha$, $\beta$ and $\gamma$ of a transistor.
18. Explain with diagrams the realisation of OR and AND gates using NAND gates.
19. Explain briefly the working of a semiconductor laser.

**SECTION C: Answer any *one* question. Each carries *ten* marks.**

20. Give the theory of plane transmission grating and describe how it is used to determine the wavelength of a light source.
21. Describe the input and output characteristics of transistor in common emitter configuration with suitable circuit diagrams and curves.

**(1 x 10 = 10 Marks)**