D 12430 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(CUCBCSS—UG)

Complementary Course

PHY 3C 03—OPTICS, LASER, ELECTRONICS AND COMMUNICATION

Time : Three Hours Maximum : 64 Marks

Section A (One Word)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. In white light, thin films appear coloured due to ———.
2. LASER is the acronym for ———.
3. In a ruby laser ——— ions is responsible for lasing action.
4. When reflected from a transparent medium, the angle of incidence for which the reflected light is completely polarized is called ———.
5. In a double refracting crystal the ray which obeys the laws of refraction is called ———.
6. An amplifier with positive feedback is used in ———.
7. The power gain of a common emitter transistor amplifier is the product of voltage gain and ———.
8. Zener diode is used as a ———.
9. When the output of a NAND gate is connected to the input of a NOT gate it works as a ——— gate.
10. In Fraunhofer diffraction the source and the screen are effectively at ——— distance from the object causing the diffraction.

(10 × 1 = 10 marks)

Section B (Short Answer Questions)

Answer **all** *questions.*
Each question carries 2 *marks.*

11. What is Barkhausen criterion for oscillations ?
12. Define transistor α and β.
13. Explain why very thin films appear black in reflected light.
14. Briefly explain the transmission and reception of signals in radio broadcasting.
15. Write the conditions for constructive and destructive interferences.
16. Derive an expression for the dispersive power of a grating.
17. Compare between AM and FM modulation.

(7 × 2 = 14 marks)

Turn over

Section C (Paragraph Questions)

Answer any **two** *questions.*
Each question carries 4 *marks.*

18. What is Population inversion ? Explain metastable state.
19. Deduce the laws of refraction using Fermat's principle.
20. Give the analytical theory of interference of light.
21. Briefly explain the working of a Colpitt's oscillator.
22. Distinguish between Fresnel Diffraction and Fraunhofer Diffraction.

(2 × 4 = 8 mark

Section D (Problems)

Answer any **three** *questions.*
Each question carries 4 *marks.*

23. Newton's rings are formed in reflected light of wavelength 600 nm with a liquid between the pla and the curved surface. If the diameter of the 6th bright ring is 3.1 mm and radius of curvature the curved surface is 1 m, calculate the refractive index of the liquid.
24. A plane wave front of light of wavelength 500 nm falls on an aperture and the diffraction patte is observed in an eye piece at a distance of 1m from the aperture. Find the radius of the 100th h period element and the area of the half period zone.
25. Find the thickness of a (a) quarter wave plate ; (b) half wave plate when light of wavelen 589 nm is used ($\mu_0 = 1.55$ and $\mu_E = 1.54$) .
26. The base current of a transistor is 105 μA and collector current is 2.05 mA. Determine the valu β, I_E and α. A change of 27 μA in the base current produced a change of 0.65 mA in the collec current. Find β_{ac}.
27. In Fraunhofer diffraction due to a narrow slit a screen is placed 2 m. away from the lens to obta the pattern. If the slit width is 0.2 mm. and the first minima lie 5 mm. on either side of the cent maximum, find the wavelength of light.

(3 × 4 = 12 mark

Section E (Essays)

Answer any **two** *questions.*
Each question carries 10 *marks.*

28. With the help of a circuit diagram explain the principle and working of a half wave and full w rectifier. Show that the rectification efficiency of full wave is twice that of a half wave rectifier
29. Derive an expression for the radius of the nth dark rings in a Newton's Ring arrangement in t reflected system. Describe an experiment to determine the wavelength of monochromatic li using Newton's rings arrangement.
30. Discuss with theory the production of (a) plane polarized ; (b) elliptically polarized ; and (c) circul polarized light.

(2 × 10 = 20 mark