D 91757 (Pages : 3) Name.....

Reg. No.....

THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020

Physics

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

Time : Three Hours Maximum : 64 Marks

Section A

Answer **all** *questions.*
Each question carries 1 *mark.*
Answer in a word **or** *a phrase.*

1. According to first law of reflection, ————, reflected ray and normal ray at the point of incidence are in ———— plane.
2. ———— are the sources of light which emit light waves of same frequency, same wavelength and have a constant initial phase difference.
3. For interference pattern, the phase difference between the two lays rays must be ————.
4. The equation for resolving power of a grating is ————.
5. The intensity of transmitted light through of polarizer is ———— the intensity of incident light.
6. In a CE amplifier phase difference between input and output is ————.
7. Zener diode can be used as a ————.
8. A NAND gate is obtained by the series combination of an AND gate and ———— gate.
9. In a ruby laser ———— ions is responsible for lasing action.
10. The medium used in radio transmission is ————.

(10 × 1 = 10 marks)

Section B

Answer **all** *questions.*
Each question carries 2 *marks.*
Answer in two **or** *three sentences.*

11. Explain Fermat's principle of least time.
12. Describe the condition to obtain sustained interference pattern.

Turn over

13. Explain the theory of a zone plate.

14. State and explain Brewster's law.

15. Describe the action of a π -filter circuit.

16. Explain the principal operation of a semiconductor laser.

17. What is demodulation ?

(7 × 2 = 14 marks)

Section C

Answer any **three** *questions.*
Each question carries 4 *marks.*
Answer in **one paragraph.**

18. For a thin film placed in air, obtain the condition for constructive interference.

19. Distinguish between Fresnel and Fraunhofer diffraction.

20. Write brief note on : (a) Quarter wave plate ; (b) Half wave plate.

21. Obtain the relation between current amplification factors α, β and γ.

22. Explain the principle and working of He-Ne laser.

(3 × 4 = 12 marks)

Section D

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

23. Light of wavelength 5839 Å is reflected at near normal incidence from a soap bubble of refractive index 1.42. What is the least thickness of the film that will appear bright by reflection ?

24. The diameter of the m^{th} Newton's ring changes from 1.2 cm. to 1 cm. when the air space between the lens and the plate is replaced by transparent liquid. Find the refractive index of the liquid.

25. For a wavelength of light λ = 6,000 Å and the redius of the first half period zone $r_1 = 6 \times 10^{-4}$ m, a zone plate brings rays to focus at its bright spot. Find the focal length of the equivalent lens.

26. Calculate the thickness of double refracting plate capable of producing path difference of $\lambda/4$ between ordinary and extra-ordinary waves. Given $\lambda = 5500$ Å, $\mu_e = 1.54, \mu_0 = 1.53$.

27. A full-wave bridge rectifier is connected to a 46 V step down transformer. If the diodes are assumed to be ideal and load resistance is 100 Ω. Find the d.c. load current and efficiency of the rectifier.

(3 × 4 = 12 marks)

Section E

Answer any **two** *questions.*

Each question carries 8 *marks.*

28. How are coherent sources formed in a biprism ? Describe the Fresnel's biprism method of determining the wavelength of light.

29. Give the construction and theory of plane transmission grating. Obtain the condition for absent spectra.

30. Explain the working of a CE amplifier. Explain its frequency response.

(2 × 8 = 16 marks)