D 51297 (Pages : 2) Name..............................

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THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(CUCBCSS—UG)

Complementary Course

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

Time : Three Hours Maximum : 64 Marks

The symbols used in this question paper have their usual meanings.

Section A (Answer in a word or a Phrase)

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

1. When white light is incident on thin films, the color appears on thin films depends on thickness and ———.
2. For Fraunhofer diffraction at a single slit, using white light, the central maximum is ——— in color.
3. Along the ——— ordinary ray and extraordinary ray travels with the same velocity.
4. The line on the output characteristics of a transistor circuit, which gives the values of collector current and collector emitter voltage corresponding to zero signal conditions is called ———.
5. ——— is a device that converts sound signal to electrical signal.

Questions 6 *to* 10 *: Write whether the following statements are True* **or** *False.*

6. Coherence length is the length of the wave packet over which it has a predictable phase.
7. Diffraction spectrum arises from interference.
8. Divergence of laser beams is very small.
9. The most lightly doped region in a transistor is emitter.
10. In amplitude modulation, the bandwidth is same as the signal frequency.

(10 × 1 = 10 marks)

Section B

Answer in two **or** *three sentences.*

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

11. Write down the law of refraction.
12. What are the conditions for two light sources to be coherent ?
13. What do you mean by the dispersive power of a grating ?
14. What do you mean by double refraction ?
15. What do you mean by the bandwidth of an amplifier ?

Turn over

16. Using a suitable figure, discuss the phenomenon of spontaneous emission.
17. What do you mean by frequency modulation ?

(7 × 2 = 14 marks)

Section C

Answer in **a paragraph** *of about* **half a page to one page.**
Answer any **three** *questions. Each question carries* 4 *marks.*

18. Explain Fermat's principle of least time.
19. Explain the Fresnel's two mirror arrangement.
20. Give the Fresnel's explanation of optical activity of substances.
21. How will you use a Zener diode as a voltage regulator ?
22. Draw the energy level diagram of a He-Ne laser and indicate the transitions involved.

(3 × 4 = 12 marks)

Section D

Problems-write all relevant formulas, all important steps carry **separate** *marks.*
Answer any **three** *questions. Each question carries* 4 *marks.*

23. Newton's rings are formed with red light of wavelength 670 nm. The radius of the 20^{th} ring is found to be 1.1×10^{-2} m. Find the radius of curvature of the lens and the radius of the 30^{th} ring.
24. Find the angular separation between the two sodium lines of wavelengths 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 metre in the second order spectrum.
25. 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 $\mu_e = 1.5533, \mu_o = 1.5442, \lambda = 500\ nm.$
26. An amplifier has a gain 200. When negative feedback is applied, the gain is reduced to 50. What is the feedback fraction ?
27. Find the operating frequency of a Collpitt's transistor oscillator if

$$C_1 = 0.001\ \mu F, C_2 = 0.01\ \mu F \text{ and } L = 15\ \mu H.$$

(3 × 4 = 12 marks)

Section E

Essays-answer in about **two pages.**
Answer any **two** *questions. Each question carries* 8 *marks.*

28. Using suitable figures, discuss the interference in a plane parallel film by reflected light. Give the conditions for maxima and minima.
29. Discuss the Fraunhofer diffraction pattern due to a single slit. Draw the intensity distribution.
30. What do you mean by circularly and plane polarized light ? Discuss briefly the production of circularly and elliptically polarized light.
31. What are universal gates ? Give truth tables for NOR and NAND gates. Construct OR, AND and NOT gates using NOR and NAND gates.

(2 × 8 = 16 marks)