

D 92288

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Name.....

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Complementary Course

PH 3C 03—OPTICS, LASER AND COMMUNICATION

Time : Three Hours

Maximum : 64 Marks

I. Answer *all* questions, each question carries 1 mark :

- 1 For elliptical reflectors light takes the _____ for all paths.
- 2 The relation between path difference and phase difference is _____.
- 3 Colours of thin film is due to the phenomenon of _____.
- 4 Wavelength of laser beam can be used as a standard of _____.
- 5 In the diffraction of light of wavelength λ at a single slit of small width e the angle θ between the central maximum and first minimum on either side is _____.
- 6 The expression for ripple factor of half wave rectifier is _____.
- 7 The relation between α and β of a transistor is _____.
- 8 Transistor works as an amplifier when it operates under _____ region.
- 9 In a CE amplifier phase difference between input and output is _____.
- 10 Optical fibers are based on the principle of _____.

(10 × 1 = 10 marks)

II. Answer *all* questions, each question carries 2 marks :

- 11 Draw the diagram of Fermat's principle in refraction.
- 12 Explain why no interference takes place in two independent light sources ?
- 13 Explain why very thin film appears black in reflected light ?
- 14 What is the principle of non-reflecting coating ?
- 15 What is Fraunhofer class of diffraction ?
- 16 Why we need modulation in communication ?
- 17 Give the principle operation of a semiconductor laser.

(7 × 2 = 14 marks)

Turn over

III. Answer any *two* questions, each question carries 4 marks :

- 18 State and explain Fermat's principle of extreme path and analyze a case where the actual path of light may be a maximum.
- 19 What is Brewster's law ? How it can be used to find polarizing angles in crystals ?
- 20 Distinguish between resolving power and dispersive power of grating. What is meant by overlapping of spectra in the spectra of a diffraction grating ?
- 21 What is Meta stable state ? Explain the role which it plays in the operation of a laser.
- 22 Discuss the different types of modulations.

(2 × 4 = 8 marks)

IV. Answer any *three* questions, each question carries 4 marks :

- 23 A drop of oil of volume 0.2 cm^3 is dropped on the surface of a tank of area 1 m^2 . The film spreads uniformly over the whole surface and white light reflected normally is observed through a spectrometer. The spectrum is seen to contain dark band whose centre has a wavelength of 550 nm in air. Find the refractive index of oil.
- 24 Newton's rings are formed in the reflected light of wavelength 600 nm with a liquid between the plane and curved surface. If the diameter of the 6th bright ring is 3.1 mm and radius of curvature of the curved surface is 1m, calculate the refractive index of the liquid.
- 25 In a grating spectrum which spectral line in the 4th order will overlap with the 3rd order of 5461 Å.
- 26 80 grams of impure sugar when dissolved in a litre of water gives an optical rotation of 9.9° when placed in a tube of length of 20 cm. If the specific rotation of sugars is 66° , find the percentage purity of the sample.
- 27 A 50 V Zener diode is used to obtain a regulated output voltage across a load $10 \text{ k}\Omega$. The series resistor is $5 \text{ k}\Omega$. If the input changes from 80 to 120V, find the maximum zener current.

(3 × 4 = 12 marks)

V. Answer any *two* questions, each question carries 10 marks :

- 28 Discuss in detail the Fresnel's biprism. Explain how the wavelength of light can be determined with its help. Give a diagram showing clearly how coherent sources are produced in a biprism. Derive the formula for the fringe width in the biprism experiment.
- 29 Draw the circuit diagram of Colpitt's oscillator. Explain briefly how it operates. Compare its working with that of Hartley oscillator.
- 30 Give the basic structure of an optical fibre. How the various refractive indices have to be related to get better working of an optical fibre ?

(2 × 10 = 20 marks)