Code No: 131AH

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, December - 2017
ENGINEERING PHYSICS - I
(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) What are the conditions for constructive and destructive interference? [2]
 b) What are the two types of diffractions? Give differences between them. [3]
 c) Explain Malus's law. [2]
 d) Explain spontaneous and stimulated emission of radiation with energy level diagram. [3]
 e) Explain the basic principle of an optical fiber. [2]
 f) Explain the term 'numerical aperture' and 'acceptance angle'. [3]
 g) Write an expression for inter planar spacing of a cubic crystal structure. [2]
 h) Derive the packing fraction of FCC crystal. [3]
 i) State Bragg's law and give the condition for constructive interference. [2]
 j) Write notes on 'point defects' in crystals [3]

PART-B

(50 Marks)

2.a) With a ray diagram discuss the interference in thin films(Reflected light).
 b) Derive the condition for constructive and destructive interference in the case of reflected system.
 c) A parallel beam of light $\lambda=5890 A^0$ is incident on a glass plate ($\mu=1.5$) such that angle of refraction is 60^0. Calculate the smallest thickness of the plate which will make it appear dark by reflection. [10]

OR

3.a) Discuss the theory of Newton rings with relevant diagram in the reflected light.
 b) Derive the expressions for the diameters of dark and bright rings.
 c) Newton rings are observed in the reflected light of wavelength $5900 A^0$. The diameter of tenth dark ring is 0.5cm. Find the radius of curvature of the lens used. [10]

4.a) What is double refraction?
 b) Explain briefly optic axis and its characteristics.
 c) Discuss the construction and working of Nicol Prism. [10]

OR

5.a) What are Einstein's coefficients? Derive relation between them.
 b) What do you understand by Population Inversion?
 c) Describe He-Ne Laser and its applications. [10]

6.a) Explain briefly different types of optical fibers.
  b) Derive numerical aperture in terms of fractional difference in refractive indices.
  c) Write any three applications of optical fibers.   [10]

OR

7.a) Draw the block diagram of an optical fiber communication system and explain the function of each block.
  b) Derive an expression for acceptance angle for an optical fiber.
  c) What are the different losses in optical fibers? Write brief note on each.   [10]

8.a) Classify the various Bravias lattice types in the crystal systems.
  b) Zinc has HCP structure. The height of the unit cell is 0.494 mm. The nearest neighbor distance is 0.27 mm. Calculate the volume of the unit cell.
  c) Describe the structure of diamond.   [10]

OR

9.a) Determine the inter-planar spacing between the two parallel planes with miller indices (h,k,l) in a cube of side 'a'.
  b) Sketch the following planes of a cubic unit cell: **(001), (120)** and $(\bar{2}11)$.
  c) A plane makes intercepts 1, 2 and 3 A^0 on the crystallographic axes of an ortho-rhombic crystal with a:b:c = 3:2:1. Determine the miller indices of this plane.   [10]

10.a) How the X-ray diffraction can be employed to determine the crystal structure? Explain.
  b) Describe with neat diagram, Laue's method of determination of crystal structure.
  c) X-rays of wavelength 1.5418 A^0 are diffracted by (111) planes in a crystal at an angle 30^0 in the first order. Calculate the inter atomic spacing.   [10]

OR

11.a) Write notes on surface defects in crystals.
  b) What is Burger's Vector? Explain.
  c) Explain edge dislocation and screw dislocation.   [10]

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