Code No: 131AC

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May/June - 2019
ENGINEERING PHYSICS
(Common to CE, ME, MCT, MMT, AE, PTM, CEE, MSNT)

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)	Describe the interference in thin films.	[2]
b)	What is a plane diffraction grating? Explain.	[3]
c)	State and explain Malus's law.	[2]
d)	How population inversion is achieved in a laser?	[3]
e)	Distinguish between the single mode and multimode optical fiber.	[2]
f)	List and explain any three applications of optical fibers.	[3]
g)	Find the number of atoms per unit cell for BCC and FCC structures in a crystal.	[2]
h)	Define lattice points, Bravais lattice and primitive cell.	[3]
i)	What are Laue spots? Explain.	[2]
j)	How are vacancies created in a lattice?	[3]

PART-B

(50 Marks)

2.a) How the wavelength of sodium light determined by Newton's rings method? Derive the formula used.
b) Why the Newton's rings are circular? Explain.
c) Calculate the minimum thickness of a soap bubble film that results in constructive interference in the reflected light if the film is illuminated with light whose wavelength in free-space is 600 nm. The index of refraction of the soap film is 1.33. [5+2+3]

OR

3.a) Give an account of the diffraction effects produced by a slit.
b) Explain what happens when the slit width is gradually increased and also when the screen is gradually moved away from the slit.
c) Light of wavelength 580 nm is incident on a slit having a width of 0.3 mm. The viewing screen is 2 m from the slit. Find the positions of first dark fringes and the width of the central bright fringe. [4+3+3]

4.a) What is plane polarized light? Explain.
b) Describe the construction and working of Nicol prism.
c) Two faces of a quartz plate are parallel to the optical axis of the crystal. What is the possible thinnest plate that would serve to put the ordinary and extraordinary rays of wavelength 589 nm a half-wave apart on their exit? The indices of refraction of quartz for ordinary and extraordinary rays are 1.544 and 1.553 respectively. [2+5+3]

OR

5.a) Describe the construction and working of a He-Ne laser.
b) Describe any three applications of lasers. [6+4]

6.a) Describe the classification of optical fibers based on refractive index profile and propagation modes.
b) Define acceptance angle and numerical aperture.
c) A step index fiber has a numerical aperture of 0.26, a core refractive index of 1.5 and a core diameter of 100 μm. Find the refractive index of cladding. [4+3+3]

OR

7.a) Discuss various attenuations taking place in an optical fiber.
b) An optical fiber is 2 m long and has a diameter of 20 μm. If a ray of light is incident on one end of the fiber at an angle of 40^0 how many reflections does it undergo before emerging from the other end? Refractive index of fiber is 1.3. [5+5]

8.a) What is coordination number?
b) Calculate the coordination number for simple cubic and body centered cubic lattices.
c) In a tetragonal lattice a = b = 2.5 Å, c = 1.8 Å. Deduce lattice spacing between (1, 1, 1) planes. [2+5+3]

OR

9.a) What are Miller indices?
b) Explain with proper example how to determine Miller indices.
c) Deduce the relation between inter planar distance and Miller indices of the planes for a cubic system. [2+4+4]

10.a) Give the theory of Braggs X-ray diffraction and derive Bragg's law.
b) Discuss about stacking faults, twin, tilt and grain boundaries. [5+5]

OR

11.a) What are crystal defects?
b) Mention the different kinds of crystal imperfections.
c) Distinguish between Schottky and Frenkel defects in ionic crystals. [3+3+4]

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