Code No: 131AC R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2017

ENGINEERING PHYSICS

(Common to CE, ME, MCT, MMT, MIE, 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) What are the conditions to get the interference of light? [2]
b) What is a plane diffraction grating? Explain. [3]
c) State and explain Brewster's law. [2]
d) Distinguish between spontaneous and stimulated emissions. [3]
e) Distinguish between the single mode and multimode optical fiber. [2]
f) Find the numerical aperture of an optical fiber having a core refractive index of 1.6 and cladding refractive index of 1.50. [3]
g) Define unit cell and lattice parameters. [2]
h) What are Miller indices? Explain [3]
i) What are Laue spots? Explain. [2]
j) What are grain boundaries? Explain. [3]

Part-B (50 Marks)

2.a) Discuss the formation of interference fringes in a thin wedge-shaped film.
b) Explain what will happen when the air in the inter space is replaced by a transparent liquid in Newton's rings experiment.
c) Find the thickness of a wedge-shaped air film at a point where fourth bright fringe is situated. Wavelength of light is 589.3 nm. [3+4+3]

OR

3.a) Describe how would you employ a plane diffraction grating to determine the wavelength of light.
b) How many orders will be visible if the wavelength of incident light is 500 nm and the number of lines on the grating is 2620 in one inch? [5+5]

4.a) State and explain Malus's law.
b) Explain how a quarter wave plate and a half wave plate could be constructed. Describe their properties.
c) Calculate the thickness of a mica sheet required for making a quarter wave plate for 546 nm wavelength. The indices of refraction for the ordinary and extraordinary rays in mica are 1.586 and 1.592 respectively. [2+5+3]

OR

5.a) What are Einstein's coefficients?
b) Obtain a relationship between them.
c) Explain the role of optical resonator in a laser. [3+4+3]

6.a) Using ray theory derive the condition for transmission of light within an optical fiber.
b) What are the characteristics of an optical fiber?
c) An optical fiber has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Find the acceptance angle for the fiber in water which has a refractive index of 1.33. [3+4+3]

OR

7.a) Discuss the advantages of optical communication system over the conventional coaxial communication system.
b) Give the block diagram of Optical fiber communication system explaining the functions of different blocks.
c) Explain the principle of any two fiber optic sensors. [3+4+3]

8.a) What is meant by atomic packing factor?
b) Calculate the atomic packing factor for SC and BCC structures.
c) Sodium crystallizes in a cubic lattice. The edge of the unit cell is 4.3Å. The density of sodium is 963 Kg/m^3 and its atomic weight is 23. What type of unit cell does sodium form? [3+4+3]

OR

9.a) Derive an expression for inter planar spacing in a cubic crystal.
b) In a crystal a lattice plane cuts intercepts of 1a, 2b and 3c along the three axes where a, b and c are primitive vectors of the unit cell. Determine the Miller indices of the given plane. [6+4]

10.a) Describe with suitable diagram the powder method for determination of crystal structure.
b) X-rays of wavelength 0.36 Å diffracted in a Braggs spectrometer at an angle of $4^0 48'$. Find the effective value of atomic spacing. [7+3]

OR

11.a) Explain edge and screw dislocations with neat diagrams.
b) Draw Burger's circuit for an edge dislocation and screw dislocation.
c) What is the significance of Burger's vector? [4+3+3]

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