BT – SH – I – 12.13 – 1242

B.Tech. Degree I Semester Examination in Naval Architecture and Ship Building December 2013

ST 103 APPLIED PHYSICS

Time: 3 Hours Maximum Marks: 50

PART A
(Answer *ALL* questions)

(5 x 2 = 10)

I. (a) Distinguish between interference and diffraction.

(b) How do you test the planeness of a surface using interference?

(c) What are positive and negative crystals?

(d) Write a short note on polarimeter.

(e) What is Meissner effect?

PART B

(5 x 8 = 40)

II. (a) Discuss the theory of interference and obtain an expression for the fringe width. (4)

(b) On placing a thin sheet of mica of thickness 12×10^{-5}cm in the path of the interfering beams in a biprism arrangement, it is found that the central bright band shifts a distance equal to the width of a bright fringe. Calculate the refractive index of mica if the wave length of light if 6×10^{-5}cm (4)

OR

III. (a) What is Compton effect? Discuss the Compton scattering and find the expression for change in wavelength. (4)

(b) In a Newton's rings experiment, the diameter of the 10^{th} ring changes from 1.40cm to 1.27cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. (4)

IV. (a) Discuss the theory of a zone plate and explain how it is useful in the study of diffraction. (4)

(b) Light is incident normally on a grating 0.5cm wide with 2500 lines. Find the angles of diffraction for the principal maxima of the two sodium lines in the first order spectrum with $\lambda_1 = 5890A^\circ$ and $\lambda_2 = 5896A^\circ$. Are the two lines resolved? (4)

OR

V. (a) Explain double refraction. Discuss the theory of elliptically and circularly polarised light. (4)

(b) Find the separation of two points on the Moon that can be resolved by a 500 cm telescope. The distance of Moon is 3.8×10^5km. The eye is most sensitive to light of $\lambda = 5500\,A^\circ$. (4)

VI. (a) Explain population inversion. Discuss the important properties and applications of lasers. (4)

(b) Discuss the magnetic tape recording and reproduction of sound. (4)

OR

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VII. (a) Discuss the production and properties of ultrasonic sound waves. (4)

(b) Explain the recording and reproduction of images in a hologram. (4)

VIII. (a) Explain the basic ideas of fibre optic communication. (4)

(b) Plane polarised light passes through a quartz plate with its optic axis parallel to the faces. Calculate the least thickness of the plate for which the emergent beam is plane polarised. (4)

OR

IX. (a) Discuss single mode and multimode fibres. (4)

(b) An optic fibre core has refractive index 1.60 and cladding has refractive index 1.55. Find the numerical aperture and acceptance angle. (4)

X. (a) What are Muller indices? Explain how they are determined. (4)

(b) Explain the various Bravais lattices and unit cells. (4)

OR

XI. (a) Discuss the qualitative ideas of BCS theory. (4)

(b) What is Josephson effect? (2)

(c) Distinguish between Type I and Type II super conductors. (2)

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