B. Tech Degree I & II Semester Examination in Marine Engineering June 2012

MRE 103 ENGINEERING PHYSICS

Time : 3 Hours | Maximum Marks : 100

I. (a) Give the theory of formation of Newton's rings in reflected system. Derive an expression for the radius of n^{th} dark ring. (9)

(b) Describe an experiment to determine wavelength of light using Newton's rings. (6)

(c) Newton's rings are formed in reflected light of wavelength 6000 Å with a liquid film between a plane and curved surfaces. If the diameter of the sixth dark ring is 3.1mm and the radius of curvature of the curved surface is 100cm, calculate the refractive index of the liquid. (5)

OR

II. (a) Explain the phenomenon of interference in thin films in reflected light. (10)

(b) How do we test the optical planeness of a glass plate using an air wedge? (5)

(c) Two optically plane glass plates of length 0.1m are placed one over the other with a wire at one end separating the two. Fringes formed with light of wavelength 5893 Å are of width 3mm. Calculate the radius of the wire. (5)

III. (a) Distinguish between Fresnel's diffraction and Fraunhofer diffraction. (5)

(b) State and explain Rayleigh's criterion for resolution. Apply this to find an expression for the resolving power of a grating. (10)

(c) Light of wavelength 6000 Å is incident normally on a grating having 6000 rulings per cm. Find the angular separation between the first and second order spectra. (5)

OR

IV. (a) Explain positive and negative crystals with reference to polarization. (5)

(b) Define specific rotation of an optically active substance. Describe an experiment to determine specific rotation by using half shade polarimeter. (10)

(c) A beam of plane polarized light of wavelength 5000 Å is incident normally on a quartz crystal cut parallel to the optic axis. Find the least thickness of the crystal for which the emergent beam is (i) circularly polarized and (ii) plane polarized. Given that the refractive indices of quartz for ordinary and extra ordinary rays are 1.544 and 1.553 respectively. (5)

V. (a) Explain spontaneous emission and stimulated emission. (5)

(b) With necessary diagrams, explain the structure and working of He – Ne laser. (10)

(c) Write a note on the applications of laser. (5)

OR

VI. (a) What is piezoelectric effect? Explain how it is used in the production of ultrasonic waves. (8)

(b) What is holography? Write a note on the recording and reconstruction of the hologram. (6)

(c) Write a note on the recording and reproduction of sound using magnetic tape. (6)

VII.	(a)	Explain the terms 'acceptance angle', 'acceptance cone' and 'numerical aperture' of an optic fiber.	(5)
	(b)	Derive an expression for the numerical aperture of a step index fiber.	(10)
	(c)	A step index fiber has a core of refractive index 1.4 and fractional refractive index 0.02. Determine the numerical aperture, acceptance angle and the critical angle.	(5)

OR

VIII.	(a)	Distinguish between step-index and graded index fiber.	(8)
	(b)	Write a note on the fiber optic communication system, specifying each part and its function.	(7)
	(c)	What are the advantages of optic fiber communication over other methods?	(5)

IX.	(a)	Differentiate between type I and type II super conductors.	(10)
	(b)	Explain dc and ac Josephson effect.	(5)
	(c)	Write a note on high temperature super conductivity.	(5)

OR

X.	(a)	What is super conductivity? Give the BCS theory of super conductivity.	(8)
	(b)	Explain: (i) Meissner effect (ii) Isotope effect	(6)
	(c)	Write notes on: (i) Gyroscope effect (ii) SONAR	(6)

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