B.Tech. Degree I & II Semester Examination in Marine Engineering May 2013

MRE 103 ENGINEERING PHYSICS

Time : 3 Hours Maximum Marks : 100

I. (a) Discuss the formation of colours in thin films and show that with monochromatic light the interference patterns of reflected and transmitted light are complementary. (10)

(b) Obtain an expression for the radius of the n^{th} dark ring in the case of Newton's rings. (7)

(c) In Newton's rings experiment, the diameters of the 4^{th} and 12^{th} dark rings are 0.400cm and 0.700cm respectively. Find the diameter of 20^{th} dark ring. (3)

OR

II. (a) Explain the formation of interference fringes by air-wedge. Derive an expression for the fringe width. How can the above method be used to measure the diameter of a thin wire accurately? (12)

(b) Explain how the phenomenon of interference is used in testing the optical planeness of a glass plate. (5)

(c) A glass wedge of angle 0.01 radian is illuminated by monochromatic light of 6000 $\mathring{A}$ falling normally on it. At what distance from the edge of the wedge, will 10^{th} fringe be observed by reflected light? (3)

III. (a) Compare a zone plate with convex lens. (6)

(b) Define and derive the expressions for the dispersive power and resolving power of grating. (11)

(c) Two pin holes 1.5mm apart are placed in front of a source of light of wave length 5.5×10^{-5} cm and seen through a telescope with its objective stopped down to a diameter of 0.4cm. Find the maximum distance from the telescope at which the pin holes can be resolved. (3)

OR

IV. (a) Distinguish between plane polarized and circularly polarized light. (4)

(b) Describe the method to produce circularly polarized light. (6)

(c) What is optical activity? Describe Fresnel's explanation for optical activity. (7)

(d) A glucose solution of unknown concentration is contained in a 12cm long tube and seen to rotate linearly polarized light by 2.5°. If the specific rotation of glucose is 52°, what is the concentration? (3)

V. (a) Distinguish between spontaneous emission and stimulated emission. (6)

(b) Explain the following: (i) population inversion (ii) pumping (iii) metastable state. (6)

(c) Write a note on ruby laser and its working. (8)

OR

VI.	(a)	Explain the working of a semi conductor Laser.	(9)
	(b)	Explain how the recording and reconstruction of a hologram can be achieved.	(9)
	(c)	Name four applications of holography.	(2)
VII.	(a)	Define numerical aperture and acceptance angle of an optic fibre. Derive the expression for numerical aperture (NA) of a step index fibre.	(8)
	(b)	How the step index fibre differs from graded-index fibre?	(6)
	(c)	How is optic communication superior to radio and microwave communication?	(3)
	(d)	Calculate the numerical aperture (NA) and hence the acceptance angle for an optical fibre given that refractive indices of the core and the cladding are 1.45 and 1.40 respectively.	(3)

OR

VIII.	(a)	Define relative refractive index difference of an optical fibre. Show how it is related to numerical aperture.	(5)
	(b)	Explain with a diagram the propagation of light through a cladded fibre.	(5)
	(c)	Draw the block diagram of an optical fibre communication system and explain the function of each block.	(6)
	(d)	An optic fibre has a NA of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water which has a refractive index of 1.33.	(4)
IX.	(a)	What is Piezo electric effect? Explain how it is applied in the production of ultrasonic waves.	(10)
	(b)	Explain NDT and SONAR.	(6)
	(c)	What are polar dielectrics and non-polar dielectrics?	(2)
	(d)	Define dielectric polarization.	(2)

OR

X.	(a)	Explain Meissner effect and Isotope effect of superconductors.	(8)
	(b)	Describe type I and type II superconductors.	(8)
	(c)	What is SQUID? Write any one of its applications.	(4)

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