B

B. Tech. Degree I & II Semester Supplementary Examination in Marine Engineering May 2015

MRE 103 ENGINEERING PHYSICS

Time : 3 Hours   Maximum Marks : 100

(5 × 20 = 100)

I.   (a)   Why is an extended source of light used to observe bands in thin films?   (3)

(b)   With the help of necessary theory explain why a thin oil film spread on a wet   (6)
road appears coloured when observed in reflected day light.

(c)   Describe the experiment to determine the radius of a thin wire using air   (8)
wedge with necessary theory. Also explain how flat surfaces are tested using
air wedge.

(d)   Two plane glass plates form a wedge shaped air film enclosing an angle of   (3)
40°. It is illuminated by monochromatic light and interference pattern is
observed vertically through a microscope. The distance between two
consecutive fringes is 0.16 cm. Calculate the wavelength of the light used.

OR

II. (a)   Explain the formation of Newton's rings in reflected monochromatic light.   (5)
Explain briefly why Newton's rings are circular. Why is the centre of the
Newton's ring system dark?

(b)   Prove that the diameters of bright rings in the reflected system of Newton's   (6)
rings are proportional to the square root of odd natural numbers.

(c)   Describe with necessary theory the Newton's ring method for measuring the   (6)
wavelength of monochromatic light.

(d)   Newton's rings are formed with light sources of wavelengths $\lambda_1 = 600\, nm$ (3)
and $\lambda_2 = 500\, nm$ and it is found that n^{th} dark ring due to λ_1 coincides with
$(n+1)^{th}$ dark ring due to λ_2. If radius of curvature of the surface of the lens
forming the rings is 1 m. Find the diameter of the nth dark ring for λ_2.

III. (a)   What are the types of diffraction and give the difference between them? Also   (6)
compare the properties of interference and diffraction patterns.

(b)   State Rayleigh's criterion and explain the term resolving power. Hence   (6)
derive an expression for the resolving power of a telescope.

(c)   Describe an experiment to determine the wavelength of light using plane   (5)
diffraction grating.

(d)   Diffraction grating used at normal incidence gives a green line of wavelength   (3)
540 nm in a certain order superimposed on a violet line of wavelength 405.4
nm of the next higher order. The angle of diffraction is 30°. Calculate the
grating element.

OR

IV.	(a)	Explain double refraction on the basis of wave theory of light.	(4)
	(b)	How will you produce and detect plane polarized, circularly polarized and elliptically polarized lights?	6)
	(c)	What is meant by optical rotation? Explain the Fresnel's theory of optical rotation. Discuss the working of a half shade polarimeter.	(7)
	(d)	A quarter wave plate of thickness 3×10^{-3} cm is cut with its faces parallel to the optic axis. Find the wave length of monochromatic light that will produce elliptically polarized light. $\mu_e = 1.52$ and $\mu_o = 1.5$ for the given material.	(3)
V.	(a)	What do you mean by coherence? Distinguish between temporal coherence and spatial coherence.	(5)
	(b)	Explain the construction and working of a Nd – YAG laser with the help of a neat energy level diagram.	(7)
	(c)	Explain briefly the working of a semiconductor laser.	(5)
	(d)	Find the relative population inversion of a ruby laser that produces a light beam of wave length 694.3 nm at (i) 300 K and (ii) 500 K.	(3)

OR

VI.	(a)	Describe briefly how electromagnetic waves are produced.	(4)
	(b)	Give any four properties of electromagnetic waves.	(4)
	(c)	Explain how a hologram is constructed. Also describe how the image is reconstructed from a hologram. Give any three advantages of holograms over ordinary photographs.	(8)
	(d)	Write a short note on recording and reproduction of sound on cine films.	(4)
VII.	(a)	How are optical fibers classified? Compare the features of different types of optical fibers.	(6)
	(b)	Describe the different type of losses associated with optical fiber.	(5)
	(c)	What do you mean by numerical aperture of an optical fiber? Derive an expression for the numerical aperture.	(6)
	(d)	The acceptance of an optical fiber is 30° in free space. What will be the angle of acceptance when it is placed in a medium of refractive index $\frac{4}{3}$.	(3)

OR

VIII.	(a)	Describe the fiber optic communication system with the help of a block diagram. Explain the roll of each part of the block diagram.	(6)
	(b)	Explain in detail the advantages of optical fiber communication over conventional communication methods.	(4)
	(c)	What are fiber optic sensors? Describe their classification. What are the advantages of fiber optic sensors?	(6)
	(d)	Briefly explain two applications of optical fibers.	(4)

IX.   (a)   Define Magnetostriction effect. With the help of a neat diagram describe the   (6)
magnetostriction method for producing ultrasonic sound. Also mention its
merits and demerits.

  (b)   What is gyroscopic effect? Explain the working of a gyrocompass. Give two   (5)
of its advantages over ordinary compass.

  (c)   What is SONAR? Describe it's working.   (4)

  (d)   What do you mean by dielectrics? Explain the properties of different types of   (5)
dielectrics with examples.

OR

X.   (a)   What is super conductivity? Discuss the effect of magnetic field on a super   (5)
conductor.

  (b)   Describe the BCS theory of super conductors. What are Cooper pairs?   (6)

  (c)   Explain the terms (i) Josephson's effect and (ii) Isotopic effect. Distinguish   (6)
between ac and dc Josephson's effect in super conductors.

  (d)   What are SQUIDS? Mention some of its uses.   (3)

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