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B.Tech. Degree I & II Semester Supplementary Examination in Marine Engineering May 2014

MRE 103 ENGINEERING PHYSICS

Time : 3 Hours   Maximum Marks :100

(5 x 20 = 100)

I. (a) For interference in thin films due to reflected light, with a neat diagram, derive the   (10)
         conditions for constructive interference and destructive interference. Hence explain
         why such a film when viewed in an extended source of white light, different parts
         appear differently coloured.
    (b) Explain how interference phenomena is utilized in testing the flatness of surfaces.   (4)
    (c) Derive the expression for fringe width in the case of fringes produced by an air wedge.   (6)

OR

II. (a) Explain how Newton's rings are formed in reflected light with sketching a neat   (10)
          diagram.
          Hence derive an expression for the wavelength of the monochromatic light used

     (b) Derive the expression for refractive index of a liquid by Newton's rings method.   (5)
     (c) A Newton's ring arrangement is used with a source emitting two wavelengths   (5)

     $\lambda_1 = 6000 \overset{\circ}{A}$ and $\lambda_2 = 4500 \overset{\circ}{A}$. It is found that the nth dark ring due to λ_1 coincides

     with the $(n+1)^{th}$ dark ring for λ_2 . If the radius of curvature of the curved surface is

     90cm, find the diameter of the nth dark ring of λ_1 .

III. (a) What is a zone plate? Derive the expression for focal length of a zone plate.   (10)
      (b) Explain on what factors a zone plate differs from a convex lens. (Give atleast two   (4)
           similarities and two differences).
      (c) With required diagrams explain Rayleigh's criteria for resolution.   (3)
      (d) Calculate the minimum number of lines per centimeter in a 2.5cm wide grating which   (3)

      will just resolve the radium lines ($5890 \overset{\circ}{A}$ and $5893 \overset{\circ}{A}$) in the second order spectrum.

OR

IV. (a) Explain Huygen's theory of double refraction with sketching wavefront diagrams.   (4)
     (b) Explain the construction and principle of working of a Nicol prism with a neat   (8)
          diagram.
     (c) Explain what is a half wave plate.   (2)
     (d) Briefly explain the following: (4)
              (i)   Optical activity
              (ii)   Detection of circularly polarised light
     (e) Calculate the specific rotation, if the plane of polarisation is turned through 26.4°,   (2)
          traversing 30cm of 25% sugar solution

(P.T.O.)

V.	(a)	Write notes on the following:	
		(i) Spatial and temporal coherence	(3)
		(ii) Population inversion	(3)

	(b)	Sketching the diagram of a Ruby, laser, with help of energy level diagram explain the construction and principle of working of a Ruby laser.	(8)
	(c)	Explain, with a diagram, how a hologram is recorded.	(6)

OR

VI.	(a)	Explain the principle of magnetic tape recording and reproducing processor with a schematic diagram.	(8)
	(b)	Briefly explain the variable area method of sound recording on cine films.	(4)
	(c)	Write short notes on:	
		(i) Diode lasers	(4)
		(ii) Applications of holography	(4)

VII.	(a)	Explain what is meant by numerical aperture (NA) in fibre optics? Derive an expression for NA interms of refractive indices of core and cladding.	(7)
	(b)	Explain step index and graded index fibres with diagrams.	(6)
	(c)	Briefly explain any five advantages of optical fibre communication.	(5)
	(d)	Calculate the critical angle for a water-air interface. The refractive index of water is 1.33.	(2)

OR

VIII.	(a)	Explain the working of a optical fibre communication system with a block diagram.	(8)
	(b)	Giving required diagrams explain a simple displacement sensor using optical fibres.	(6)
	(c)	Write notes on:	
		(i) Slab and strip waveguides	(3)
		(ii) Modes in optical fibres	(3)

IX.	(a)	Briefly explain the principle of working of SONAR.	(3)
	(b)	Explain non-destructive testing of materials using ultrasonic waves with the help of a block diagram.	(7)
	(c)	Explain the principle of working of a gyro compass.	(5)
	(d)	Explain any one application of echo sounder.	(5)

OR

X.	(a)	What is Merssner effect?	(2)
	(b)	Explain Type I and Type II super conductors with diagrams.	(6)
	(c)	Briefly explain BCS theory of super conductivity.	(6)
	(d)	Write notes on:	
		(i) High temperature super conductivity	(3)
		(ii) SQUIDS	(3)

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