BTMRE-I&II(S)05.16-0760 Reg.No. | | | | | | | | | B

B.Tech. Degree I & II Semester Supplementary Examination in Marine Engineering May 2016

MRE 103 ENGINEERING PHYSICS

Time : 3 Hours Maximum Marks : 100

(5 × 20 = 100)

I. (a) Explain how Newton's rings are formed and describe the method of determination of wavelength of light using Newton's rings. (12)

(b) How can the refractive index of a liquid be determined using Newton's rings? (5)

(c) In a Newton's ring arrangement, if a drop of water having refractive index 1.33 is placed between the lens and the plate, the diameter of the 10^{th} ring is found to be 6×10^{-3} m. Obtain the radius of curvature of the face of lens in contact with the plate. The wave length of light used is 600 nm. (3)

OR

II. (a) Discuss the conditions of interference of light in a wedge shaped film. (6)

(b) Describe air-wedge of determination of the diameter of a thin wire. (6)

(c) An air-wedge of angle 30 seconds is illuminated by a light of wavelength 5896 A^{o}. Calculate the fringe width. (3)

(d) Discuss briefly the phenomenon of interference with relation to law of conservation of energy. (5)

III. (a) Explain the construction and theory of plane transmission grating and the formation of spectra by it. (12)

(b) Distinguish between dispersive power and resolving power of a grating. (5)

(c) A plane diffraction grating has 15000 lines/inch. Find the angle of separation of the 504.8 nm and 501.6 nm lines of the He source in the first order spectrum. Also, calculate the angular separation of two lines in 2^{nd} order. (3)

OR

IV. (a) Discuss the phenomenon of rotation of the plane of polarization of light by an optically active material. Give the necessary theory. (10)

(b) Give the construction and working of Laurent's half-shade polarimeter. (7)

(c) Calculate the difference in the refractive indices for a quartz crystal whose specific rotation is 29.73^{o} per mm for light having 508.6 nm wavelengths. (3)

V. (a) Distinguish between spontaneous emission and stimulated emission of light. (5)

(b) Explain the principle, construction and working of a semiconductor laser with a neat diagram. (12)

(c) Calculate the wavelength of emitted radiation from GaAs which has a band gap of 1.44 eV. (3)

OR

VI. (a) Explain construction and working of a Ruby laser with a neat diagram. (9)

(b) Distinguish between spatial coherence and temporal coherence. (5)

(c) Discuss any three applications of laser. (3)

(d) A ruby laser emits light of 693.95 nm wavelength. The duration of pulses is 0.1 ns. Calculate the coherence length. (3)

VII. (a) What is 'mode' in optical fibre? (3)

(b) Distinguish between multimode and single mode fibres. (5)

(c) Describe fibre optic communication system. (6)

(d) What are the advantages of fibre optic communication system over the conventional ones? (3)

(e) The NA of an optical fibre is 0.39. If the difference in refractive indices of the material of its core and cladding is 0.05, calculate the refractive index of material of the core. (3)

OR

VIII. (a) Explain the principle of an optical fibre. (4)

(b) Write short notes on acceptance angle in a fibre. (4)

(c) Describe any three fibre optic sensor applications. (3)

(d) The refractive index of core of step index fibre is 1.5 and the fractional change in refractive index is 4%. Estimate (i) refractive index of cladding (ii) NA (iii) acceptance angle in air (iv) critical angle at the core-cladding interface. (6)

(e) An optical fibre has a NA of 0.2 and a cladding refractive index of 1.59. Find the acceptance angle for the fibre in water which has a refractive index of 1.33. (3)

IX. (a) Explain the working of SONAR. (4)

(b) What is a dielectric material? Give any three applications of dielectrics. (6)

(c) Explain the principle of working of a gyro compass. (7)

(d) A parallel capacitor has an area of 100 cm^2, a plate separation of 1 cm and is charged to a potential of 100 V. Calculate the capacitance of the capacitor and the charge on the plates. (3)

OR

X. (a) Explain the following terms in superconductivity. (8)
(i) Transition temperature (ii) Critical magnetic field. (iii) Cooper pairs
(iv) SQUID

(b) Describe Josephson Effect and their applications. (9)

(c) A lead superconductor with Tc 7.2 K has a critical magnetic field of 6.5×10^3 Am^{-1} at absolute zero. What would be the critical field at 5 K temperature? (3)

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