BT-MRE-I&II(S)-04.21-0283 Reg. No. | | | | | | | | |

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B.Tech. Degree I & II Semester Supplementary Examination in Marine Engineering April 2021

MRE 1103 ENGINEERING PHYSICS

(2013 Scheme)

Time: 3 Hours Maximum Marks: 100

(5 × 20 = 100)

I. (a) What are the conditions to be satisfied for obtaining a clear interference pattern? (4)

(b) Explain the formation of interference fringes in an air-wedge. Derive an expression for the fringe width. (12)

(c) Newton's rings are formed in reflected light in a liquid film held between a plane glass plate and a planoconvex lens of radius of curvature 1 m. If the diameter of the 5th dark ring is 0.3 cm, calculate the refractive index of the liquid. Wavelength of light used is 589 nm. (4)

OR

II. (a) What are characteristic X-rays? Explain their origin. Find an expression for the minimum wavelength of X-rays. (8)

(b) Derive Bragg's law in the X-ray diffraction. (5)

(c) Explain Compton effect. Write down the expression for Compton shift. (4)

(d) An X-ray tube is operated at 20 KV. Calculate the minimum velocity of the electrons reaching the target. (3)

III. (a) Distinguish between Fresnel's dittraction and Fraunhofer dittraction. (4)

(b) Explain the construction and the action of the zone plate. (12)

(c) A grating of 5 cm wide has 320 ratings per cm. What is the least difference in wavelength between spectral lines that can be resolved in the second order in the wavelength region of 640 nm? (4)

OR

IV. (a) What is double refraction in uniaxial crystals? Explain about positive and negative crystals. (8)

(b) How do you identify the nature of polarization of a given beam of light? Explain. (8)

(c) Calculate the minimum thickness of a calcite plate that converts plane polarised light of wavelength 550 nm into elliptically polarised light. Refractive indices of calcite for ordinary and extra-ordinary rays are 1.656 and 1.485 respectively. (4)

V. (a) Expalin stimulated emission of radiation. (4)

(b) What is metastable state? Explain its importance in lasers. (4)

(c) With necessary diagrams, explain the working of Ruby laser. Mention some of its applications. (12)

OR

VI. (a) Distinguish between photography and holography. (4)

(b) Describe how a hologram is recorded and reconstructed. (8)

(c) Describe the principle and working of a semiconductor laser. (8)

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VII. (a) Distinguish between step-index fibre and grade-index fibre. (6)

(b) Define 'numerical aperture' and 'acceptance angle'. Derive an expression for the numerical aperture of a step-index fibre. (10)

(c) A fibre has core refractive index 1.50 and fractional refractive index 0.02. Find the refractive index of the cladding and the acceptance angle of the fibre. (4)

OR

VIII. (a) With a block diagram explain about an optical fibre communication system. Discuss some of its advantages. (10)

(b) Discuss the different types of losses and dispersion in optical fibres. (10)

IX. (a) What is magnetostriction effect? Explain how is it used in the generation of ultrasonic waves. (10)

(b) Explain the recording and reproduction of sound using magnetic tapes. (10)

OR

X. (a) Explain 'Meissner effect' and 'isotpoe effect' in superconductors. (6)

(b) Distinguish between type I and type II superconductors. (8)

(c) Explain the dc and ac Josephson effect. (6)

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