BT–MRE–I&II–05.19-0858   Reg. No. ☐☐☐☐☐☐☐☐   **B**

B.Tech. Degree I&II Semester Examination in Marine Engineering May 2019

MRE 1103 ENGINEERING PHYSICS
(2013 Scheme)

Time : 3 Hours   Maximum Marks : 100

(5 × 20 = 100)

I. (a) Discuss the theory of interference in a thin film of uniform thickness observed in reflected light. (12)

   (b) Explain the colours in thin films illuminated by white light. (4)

   (c) Interference fringes are formed in a thin air wedge using light of warelength 590 nm incident normally. If the angle of the wedge is 2.95×10^{-4} radian, estimate the band-width of the fringes. (4)

OR

II. (a) Derive Bragg's Law in X-rays. (4)

   (b) Describe the Bragg's spectrometer and explain how it is used to determine wavelength of X-rays. (12)

   (c) An X-ray tube is operating at 66 KV. Calculate the shortest wavelength limit of X-rays. Given that $h = 6.63 \times 10^{-34} Js$, $e = 1.6 \times 10^{-19}$ coulomb and $c = 3 \times 10^8 \ ms^{-1}$. (4)

III. (a) Distinguish between Fresnel's diffraction and Fraunhoffer diffraction. (4)

   (b) Give the theory of plane transmission grating. Explain dispersive power and resolving power of the grating. (12)

   (c) Calculate the aperture of the objective of a telescope which may just resolve stars separated by 6.1×10^{-6} radian for light of wavelength 550 nm. (4)

OR

IV. (a) Explain the phenomenon of double refraction. (4)

   (b) Describe the construction of Nicol prism and explain its action as polarizer and analyser. (12)

   (c) Calculate the thickness of a calcite plate that converts linearly polarized light into elliptically polarized light. Given that $\mu_o = 1.485$, $\mu_e = 1.656$ and wavelength of light = 589 nm. (4)

V. (a) Explain 'spontaneous emission' and 'stimulated emission'. (4)

   (b) Describe with necessary diagrams the construction and working of Ruby Laser. (10)

   (c) Write a note on 'temporal coherence' and 'spatial coherence'. (6)

OR

VI. (a) Explain the basic principle of holography. (4)

   (b) Describe the method of recording and reconstruction of transmission hologram. (12)

   (c) Write a note on the applications of holography. (4)

VII. (a) Define 'numerical aperture' and 'mode' in an optical fibre. (4)

   (b) Derive an expression for the numerical aperture of a step-index fibre in terms of the core refractive index and the fractional refractive index. (12)

   (c) A communication system uses a 10 Km fibre having a fibre loss 2.5 dB/Km. If the output power is 1.2 µw, determine the input power. (4)

OR

(P.T.O.)

VIII. (a) Explain the recording and reproduction of sound using magnetic tape. (8)

(b) Describe with the help of block diagram, the working of an optical fibre communication system. What are the advantages of the optical fibre communication system over other methods? (12)

IX. (a) What is magnetostriction effect? Describe how is it used for the production of ultrasonic sound. (10)

(b) Write notes on: (10)

    (i) gyroscopic effect

    (ii) SONAR

    (iii) flaw detection using ultrasonic waves.

OR

X. (a) Explain 'transition temperature' and critical magnetic field' with respect to a superconducting substance. State the relations connecting the two. (6)

(b) What are type I and type II superconductors? Give examples. (6)

(c) Write notes on: (8)

    (i) dc Josephson effect

    (ii) ac Josephson effect

    (iii) SQUID

***