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***B.Tech. Degree I Semester Regular/Supplementary Examination in
Marine Engineering December 2021***

**19-208-0102 ENGINEERING PHYSICS
(2019 Scheme)**

Time: 3 Hours

Maximum Marks: 60

(5 × 15 = 75)

- I. (a) Obtain the condition for constructive and destructive interference in the case of light reflected from a thin film. Explain why a soap bubble seen in day light is coloured. (5)
- (b) Explain with diagram, a method of production of X-rays. (5)
- (c) A parallel beam of light with wavelength 589 nm is incident on a thin glass plate of refractive index 1.5, such that the angle of refraction in the plate is 55° . Calculate the minimum thickness of the glass plate which will appear dark by reflection. (5)
- OR**
- II. (a) Explain with necessary theory, how to determine the wavelength of a monochromatic light, using Newton's rings set-up. (5)
- (b) An X-ray tube is operated at 25 kV. Calculate the minimum wavelength of X-rays emitted from it. (5)
- (c) Two optically plane glass plates of length 0.08 m are placed one over the other with a thin wire at one end separating the two. Calculate the radius of the wire, if the fringes formed with light of wavelength 5893 \AA are of width 2mm. (5)
- III. (a) Explain the construction and theory of transmission grating and the formation of spectra by it. (5)
- (b) Distinguish between plane polarized and circularly polarized light. (5)
- (c) The first order maximum for light of wavelength 600 nm is obtained at an angle of 20 degree for normal incidence of light on the grating. Calculate the number of lines per unit length of the grating. (5)
- OR**
- IV. (a) What is meant by optical rotation? Explain the Fresnel's theory of optical rotation. Discuss the working of Laurent's half shade polarimeter. (5)
- (b) Explain the features of a zone plate and compare it with a convex lens. (5)
- (c) Calculate the specific rotation, if the plane of polarization is turned through 30 degrees on traversing 20 cm length of 20% sugar solution. (5)
- V. (a) Describe the construction and working of He-Ne laser, using energy level diagram. (5)
- (b) Explain the principle of recording and reproduction of sound using magnetic tapes. (5)
- (c) Write a note on semiconductor lasers. (5)
- OR**
- VI. (a) Describe the principle of recording and reconstruction of hologram. (5)
- (b) Explain the method of recording an audio signal on cine films. (5)
- (c) Distinguish between spontaneous and stimulated emission. (5)

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- VII. (a) What is numerical aperture? Obtain an expression for numerical aperture in terms of refractive indices of the core and cladding of the fibre. (5)
- (b) What are fibre optic sensors? What are their advantages? (5)
- (c) Calculate the acceptance angle that a ray makes with the axis of a step index fibre, if it is guided through a fibre with the parameters, $n_{\text{core}} = 1.6$; $n_{\text{cladding}} = 1.5$. (5)

OR

- VIII. (a) How are optical fibres classified? Compare the features of different types of optical fibres. (5)
- (b) Describe the fibre optic communication system using a block diagram. (5)
- (c) A step index fibre has the following parameters, $n_1 = 1.68$; $n_2 = 1.44$. Calculate the numerical aperture and critical propagation angle. (5)

- IX. (a) Discuss the high temperature superconductivity and its applications. (5)
- (b) Explain the working of an echo sounder. (5)
- (c) Distinguish between Type I and Type II superconductors. (5)

OR

- X. (a) Describe the production and properties of ultrasonic waves. (5)
- (b) Give the BCS theory of superconductivity. (5)
- (c) What is SQUID? What is its application? (5)
