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

MRE 1103 ENGINEERING PHYSICS

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Drawing necessary expressions, explain how the thickness of a thin transparent film can be determined by interference of light method. (8)
- (b) With a diagram explain how Newton's rings are formed using a monochromatic light source and hence derive the equation for wavelength in terms of diameters of Newton's rings. (9)
- (c) Monochromatic light is incident on a thin wedge shaped transparent film of refractive index 1.4. Interference fringes are viewed in reflected light whose fringe width is 0.026 cm. If $\lambda = 5900 \text{ \AA}$, find the angle of the wedge. (3)

OR

- II. (a) With a neat diagram, explain the production X-rays. (6)
- (b) What are continuous X-rays? Explain. Derive the expression for wavelength λ_{\min} in this case. (6)
- (c) With a diagram explain the working of Bragg's X-ray spectrometer. Explain the observation with the help of ionization current versus glancing angle graph. (8)
- III. (a) Explain the phenomenon of diffraction and hence distinguish between Fresnel and Fraunhofer diffraction. (5)
- (b) What is a zone plate? Explain how it is fabricated. Compare the characteristic properties of a zone plate and a convex lens. (7)
- (c) Briefly explain the conditions for secondary maxima and minima in a diffraction pattern of a plane transmission grating. (5)
- (d) Calculate the minimum number of lines per centimeter in a 2.5 cm wide grating which will just resolve the sodium lines with wavelength 5890 \AA and 5896 \AA . (3)

OR

- IV. (a) Explain the phenomena of: (6)
- (i) Double refraction. (ii) Optical activity.
- (b) With a neat diagram explain the principle and working of a half shade polarimeter used for finding the specific rotation of sugar solution. (10)
- (c) Explain the following. (4)
- (i) Plane polarized light.
- (ii) Circularly polarized light.

- V. (a) Explain what is meant by spontaneous emission and stimulated emission. (3)
- (b) With a neat diagram explain the principle and working of a Ruby laser or a Nd-YAG laser. (12)
- (c) Write a note on applications of laser. (5)

OR

(P.T.O.)

- VI. (a) Explain the principle of holography. With neat diagrams explain the method of recording and reconstruction of a hologram. (15)
(b) Briefly explain how an audio signal is recorded on a magnetic tape. (5)
- VII. (a) What is meant by numerical aperture of an optic fibre? Explain. (2)
(b) With diagrams explain: (10)
(i) Step index fibres (ii) Graded index fibres.
(c) Write short notes on: (8)
(i) Single mode and multimode fibres
(ii) Applications of optic fibres and their advantages over conventional systems.
- OR**
- VIII. (a) Explain the working of a modern communication system using optical fibres with the help of a block diagram. (8)
(b) Sketching diagrams explain the use of optical fibres in : (9)
(i) A displacement sensor.
(ii) A temperature sensor.
(c) Write a short note on integrated optics. (3)
- IX. (a) Explain the working of a gyroscope. (5)
(b) Explain with necessary diagrams, use of ultrasound wave in : (15)
(i) Echo sounding. (ii) flaw detection. (iii) depth measurement.
- OR**
- X. (a) Explain the following. (4)
(i) Meissner effect. (ii) Josephson effect.
(b) Give BCS theory of super conductivity. (8)
(c) With the help of magnetization curves explain Type I and Type II super conductors. (3)