

Bago University
Department of Physics
Second Semester Examination, September 2019

Second Year (BSc)
(Physics Specialization)

Phys 2108
Optics & Photonics III
Time Allowed: (3) Hours

Answer any Six questions.

- 1 (a) What is the interference of light? Write down the equation to find the intensity of interference fringes on the screen. Discuss on the intensity distribution in the fringe system by the figure.
(b) A transparent plate of refractive index 1.5 is placed in the path of one of the interfering beams of a biprism experiment using light of wavelength 500 nm. If the central fringes shifts by a distance equal to the width of ten fringes, calculate the thickness of the plate.
 - 2 (a) Describe the wavelength of light obtained and the distance between the two virtual sources in Fresnel's biprism arrangement and explain the symbols used.
(b) By means of a Fresnel biprism interference fringes are produced on a screen 0.80 m away from the biprism, using light of wavelength equal to 6×10^{-7} m. Find the distance between the two images produced by the biprism if 21 fringes cover a distance of 2.4 mm on the screen.
 - 3 (a) Why are the different colours seen on the soap film or oil floating over water? Why does interference in the case of thin films take place? Depict multiple reflections in a plane-parallel film.
(b) The radius of curvature of the convex surface of a plano-convex lens is 30 cm. The lens is placed convex side down on a plane glass plate, and illuminated from above with red light of wavelength 650 nm. Find the diameter of the third bright ring in the interference pattern.
 - 4 (a) In a Newton's rings experiment, the diameters of 4th and 12th dark rings are 0.004 m and 0.007 m respectively. Deduce the diameter of the 20th dark ring.
(b) An air wedge is formed by using two plane glass plates inclined at an angle of 0.5° between them. A parallel beam of monochromatic light of wavelength 584 nm is incident normally on it. (i) Find the bandwidth obtained. (ii) If a liquid of refractive index 1.32 is introduced in between the two plates, what will be the bandwidth?
 - 5 (a) What is diffraction? How does the Fraunhofer and Fresnel diffraction differ?
(b) A parallel beam of light is made incident on a plane transmission diffraction grating of 15,000 lines per inch and angle of 2nd order diffraction is found to be 45° . Calculate the wavelength of light used.
 - 6 (a) In the Fraunhofer diffraction pattern of a double-slit, it is found that the fourth secondary maximum is missing. What is the ratio of slit width 'b' to slit separation 'd'?
(b) Light of wavelength 500 nm falls on a grating normally. Two adjacent principal maxima occur at $\sin \theta = 0.2$ and $\sin \theta = 0.3$ respectively. Calculate the grating element.
 - 7 (a) Write out short notes for relative population and population inversion.
(b) The ruby laser has two states at 300 K and 500 K. If it emits light 700 nm, then compute relative population.
 - 8 (a) How do you understand photonics? Which are included in photonic technology?
(b) Describe and explain the applications of photonics that you know.
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