Dr Neetika
24/11/2023
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End Semester Examination, Nov-2023
National Institute of Technology, Hamirpur
Department of Physics & Photonics Science

Program : B.Tech. Engineering Physics	Semester : 5
Course code : PH-314	Course Title : Engineering Optics
Max. Marks : 50	Max time allowed : 3 hrs

Q.No.	Questions	Marks
1.	a) Write a short note on optical activity. b) Differentiate between positive and negative crystals. c) Explain the artificial double refraction. d) The polarizing angle of air and a polarizing material is 60°, calculate the refractive index of material. e) What is the effect of decreasing the radius of curvature of plano-convex lens on the size of Newton rings? f) If circularly polarized light is passed though a half wave plate, what type of light will you get at the output. g) Two convex lens of focal length 10 cm and 20 cm are placed in air at a separation of 5 cm. Calculate the equivalent focal length and cardinal points of system. h) What is the ratio of intensity of secondary maximum to the principal maximum in a diffraction grating? i) Explain spherical and coma aberrations with the help of a suitable ray diagram. j) State the parameters on which resolving power of plane diffraction grating depends.	10
2.	State and explain the Fermat's principle of extremum path. Deduce the law of reflection and refraction of light using Fermat's Principle.	5
3.	a) Derive an expression for the intensity distribution due to Fraunhofer diffraction at a single slit and show that the intensity of the first subsidiary maximum is about 4.5% of that of the principal maximum. b) Calculate the missing orders in a double slit Fraunhofer diffraction pattern, if the widths of slits are 0.08 mm and they are 0.4 mm apart.	5
4.	a) Explain the formation of interference fringes by Fresnel's biprism with a monochromatic source of light, and derive the expression for the fringe width. b) Biprism is kept 15 cm away from the slit illuminated by monochromatic light of wavelength = 5896 Å. The width of fringes obtained on a screen placed at a distance of 90 cm from the biprism is 0.9 mm. Calculate the distance between two sources.	5
5	a) What is chromatic aberration? Derive the condition for achromatism in a combination of two thin lenses placed in contact. b) The focal length of an achromatic combination of two lenses in contact is 150 cm. If the dispersive power of the material of the two lenses are 0.018 and 0.027, calculate the focal length of the two lenses.	5
6.	Explain the formation of fringes in i) Fabry parot interferometer (FPI) and ii) Michelson interferometer (MI). Give the advantages of FPI over MI.	5
7.	Explain the Fresnel's half-period zones. Prove that the resultant amplitude due to a large wavefront is equal to half of the amplitude due to the first half-period zone acting alone. Hence give Fresnel's explanations of rectilinear propagation of light.	5
8.	Describe the construction and working of a Nicol Prism. How with the help of a Nicol prism and a quarter/half wave plate, plane polarised light, circularly polarised light, and elliptically polarized light can be produced and detected.	5
9	Define specific rotation. Describe the construction and working of biquartz polarimeter to find the specific rotation of sugar solution. Discuss the utility of biquartz plate.	5