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FIFTH SEMESTER (CUFYUGP) DEGREE EXAMINATION, NOVEMBER 2026

PHYSICS / APPLIED PHYSICS

PHY5CJ302 / APH5CJ302: OPTICS

2024 Admission onwards

Maximum Time :2 Hours | **Maximum Marks :70**

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	What conditions must be satisfied to obtain a sustained interference pattern.
2	Explain polarization of light. How does it prove that light is transverse in nature?
3	How does a zone plate differ from a convex lens?
4	Differentiate between Fresnel and Fraunhofer diffraction.
5	Why do soap bubbles and oil films show beautiful colors?
6	Distinguish between plane polarized, circularly polarized, elliptically polarized and unpolarized light.
7	Describe how quarter wave and half wave plates are made?
8	What do you mean by optical path? Derive the condition for two rays to interfere constructively in terms of optical path difference.
9	Explain the concept of paraxial rays and the paraxial approximation in ray optics.
10	Obtain the Gaussian formula for a spherical refracting surface spherical separating two media of refractive indices n_1 and n_2.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling : 36 Marks)

11	Explain the experimental method of determining the wavelength of sodium light using Newton's rings.
12	In Fraunhoffer diffraction pattern due to a narrow slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima lie 5 mm on either side of the central maximum, find the wavelength of light.
13	Explain how a zone plate behaves like a lens of variable focal length.
14	What is Fresnel's biprism? Explain how it is used to determine the wavelength of monochromatic light.
15	Discuss Huygens' theory of double refraction in uniaxial crystals.
16	A narrow slit illuminated by light of wave length 4500 A° is placed at a distance of 20 cm from a straight edge. Calculate the distance between the second and third diffraction maxima formed on a screen placed at a distance of 60 cm from straight edge.
17	a) Calculate the least thickness of a calcite plate which would convert plane polarized light into circularly polarized light. Given μ_o =1.658, μ_e = 1.486 and wavelength of light is 5890 A°. (3 marks) b) A plane-polarized light of wavelength 5893 A° is incident perpendicularly on a quartz plate cut with faces parallel to the optic axis. If the refractive indices for the ordinary and extraordinary rays are

	1.544 and 1.553, respectively, find the thickness of the quartz plate which introduces a phase difference of 60°between the extraordinary and ordinary rays. (3 marks)
18	Explain the laws of refraction on the basis of Fermat's principle.
Section C	
Answer any ONE .Each Question carries 10 marks (1x10=10 Marks)	
19	Discuss the theory of formation of fringes in Fresnel diffraction at a straight edge.
20	Explain Young's double-slit experiment with a neat diagram. Derive the expression for the fringe width. Obtain the intensity distribution and the conditions for maxima and minima.