2025-05-05

INTRODUCTION TO OPTICS

Dept of Physics-SEAS

SRM University A.P

Registration Number: _____

Name: _____

Branch & Section: _____

SRM UNIVERSITY AP
Andhra Pradesh

SRM UNIVERSITY – AP, ANDHRA PRADESH

End Term Examination, May 2025

[Question Paper ID: **009040]**

Subject Title	: INTRODUCTION TO OPTICS	**Subject Code**	: PHY 207
Batch	: 2023	**Max Marks**	: 100
Degree	: B.Sc.	**Duration**	: 3 hours
Branch	: Scie.	**QP Set**	: ---

Answer any 10 Questions (10 × 10 Marks = 100 Marks)

Answer **any 10** Questions

			Marks	BL	CO
1.	Derive the expression for effective focal length for the lens system of focal lengths *f*1 and *f*2 and separated by a distance d.	**10**	10	2	5
2.	If the critical angle for certain oil is found as 30 deg then find the Brewster's angle for the same oil. Please note that the total internal reflection happen if the light enters from denser medium to rarer medium whereas the Brewster's phenomena happen when it enters from rarer to denser medium. (10)	**10**	10	3	4
3.	a) Derive the expression for Brewster's angle used to generate the polarized light? (5) b) Describe half wave plate and quarter wave plate. (5)	**10**	10	1	4
4.	a) Define polarization and discuss about the various states of polarization (5) b) Describe Malus law. (3) c) how much intensity of unpolarized light will be transmitted if it passes through a polarizer aligned at 60 deg? (2)	**10**	10	2	4
5.	Derive the expression for intensity distribution after diffracting the light through a single slit. (10)	**10**	10	2	3
6.	a) 6) How many fringe shifts will be seen in a Michelson interferometer in monochromatic light ($\lambda 0$ = 500 nm) if a path length of x = 2 cm in one of the arms changes from air (nair = 1.00039) to vacuum? (5) b) 7) A monochromatic light with wavelength of 350 nm strikes a grating containing 20,000 slits/cm. Determine the angular positions of the second-order bright line. (5)	**10**	10	3	3
7.	a) A filter is used to obtain nearly monochromatic radiation from white light. If the pass band for the filter is 5nm and the mean frequency is $4*10^{14}$Hz, find the coherence length and coherence time of the filtered light. (5) b) Light waves from two coherent sources having the intensity ratio 25:1 produce the interference pattern. Find the ratio of maximum to minimum intensity and the fringe visibility. (5)	**10**	10	3	1,2
8.	Draw the ray diagram for the image formation through convex lens and mention the properties of the image if the object is placed at a) at infinity b) at twice the focal length c) at the focal length d) below the focal length. (2+3+2+3).	**10**	10	2	1,5
9.	a) Define and draw the schematic for spatial filtering. (5) b) Describe the methodology for constructing the hologram and for reconstructing the object. (5)	**10**	10	2	4,5
10.	a) Define Snell's law for refraction (2) b) Derive the conditions for total internal reflection and also for the critical angle (5) c) A ray of light travels from water (refractive index =1.33) to air (refractive index =1.00). If the angle of incidence in water is 48 deg then is it possible to get the total internal reflection? (3)	**10**	10	2	1,2

11.	A beam of light consisting of two wavelengths, 550 nm and 480 is used to obtain interference fringes in Young's double slit experiment. The distance between the slit is 3.0 mm and the distance between the plane of the slits and the screen is 150 cm. (a) Find the distance of the third bright fringe on the screen from the central maximum for the wavelength 550 nm. (b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? (5+5)	**10**	**10**	**3**	**2,3**
12.	Derive the expression for m^{th} order bright fringe in young's double slit experiment. Also find the expression for fringe width defined as the distance between two consecutive bright or dark fringes.	**10**	**10**	**2**	**2**
13.	In a two slit interference pattern with wavelength 500 nm, the zero order and tenth order maxima fall at 10.34 mm and 12.73 mm respectively. If wavelength is changed to 400 nm, deduce the positions of the zero order and 20th fringe; other arrangements remaining the same. (5+5)	**10**	**10**	**2**	**1,2**
14.	a) State the postulates of Huygen's wave theory (3) b) Define coherence in terms of phase relationship between two waves. (2) c) Derive the expression for coherence length as a function of wavelength spectrum. (5)	**10**	**10**	**2**	**1,2**
15.	Derive the law of reflection and refraction using Huygens's theory. (5+5)	**10**	**10**	**1**	**1,2**

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