

# SEM-II UG1 Physics Honours

## ASSIGNMENTS : April 2020

T. Mukherjee, e-mail: tapas.mukherjee1@gmail.com

### SUB: Optics

Give Name and Roll No.

Full Marks: 50

1. Does the function  $\psi(x,t) = A(x - vt)$  represent a wave? (A is constant).  
Explain what is wave front? What is a plane wave? 5
2. Find the expression for fringe-width in case of Young's double slit. Show that the dark and bright fringes are equally spaced. 6
3. State and explain, in brief, the conditions for the interference of light for (a) observance, (b) good contrast and (c) sustained interference pattern. 6
4. Give Stokes' treatment to explain the change of phase when reflection takes place at a denser medium. 3
5. Is the conservation of energy principal is violated in interference? Explain. 2
6. How does interference take place in thin films? Show that the reflected and the transmitted interference pattern are complementary to each other. 5
7. Describe the expression for the radius at  $m$ th Newton's ring- dark as well as bright- to show that while diameters of dark rings are proportional to the square root of simple numbers, those of bright rings are proportional to the square root of odd simple numbers. 5
8. Show that the fringe-width decreases with the order in Newton's ring. 3
9. How will you test the flatness of a surface by interference? 3
10. What will happen if white light is used instead of monochromatic light in Newton's ring experiment? 2
11. Consider two waves that are superposing  
 $f_1(x) = A \sin(kx)$   
 $f_2(x) = A \sin(kx + \pi/4)$ .  
What is the wavelength of the resultant wave? What is the amplitude of the resultant wave? 3

12. Calculate the fractional change in fringe width in Young's double slit experiment if the wavelength of the incident ray changed from 500 nm to 600 nm. 3
13. An oil film ( $\mu = 1.2$ ) on water ( $\mu = 1.33$ ) is viewed directly above, with light of wavelength 600 nm in air. The film appears circular and has a centre thickness  $1\mu\text{m}$  decreasing to zero thickness at the edge. Explain if the edge will appear bright or dark. How many dark rings will appear in the fringe? 4