



AIR FORCE INSTITUTE OF TECHNOLOGY
FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS
SECOND SEMESTER EXAMINATION 2020/2021 SESSION
BACHELOR OF SCIENCE (B.Sc.) - 200 LEVEL
PHYSICS & PHYSICS WITH ELECTRONICS

119P11021
4252

Course Title: CLASICAL PHYSICS II [ELECTROMAGNETISM]
Course Code: PHY 214 Credit Unit: 2 Units
Duration: 2 Hours Date: 01 FEBRUARY 2022

Instructions: Answer Any Three (3) Questions.

- (a) Define flux in terms of electric field and give 3 examples. [5 marks]

(b) Write the equation for flux of the Electric Field passing through a closed surface [5 marks]

(c) With the aid of diagram explain uniform linear charge [5 marks]

(d) Derive the Four (4) Maxwell's Equations in both differential and Integral form. [10 marks]
- (a) Explain the term interference and state two (2) conditions for sustained interference. [5 marks]

(b) Consider two waves (Y_1) and (Y_2) travelling in the same direction as in the figure below. Calculate the resultant amplitude if the waves have a phase difference of $\theta = \pi/3$ [5 marks]

(c) What is Lloyd's mirror? State two major ways for creating coherent sources for interferometry and identify the source Lloyd's Mirror used [5 marks]

(d) In Newton's rings experiment, the diameter of certain order of dark ring is measured to be two (2) times that of second ring. Determine the order of the ring and State what happens to the path difference when the:
(i) angle of diffraction increases (ii) slit separation decreases [5 marks]
- (a) Derive the Biot-Savart Law. [10 marks]

(b) Gauss's laws are amongst the most fundamental relationships in electromagnetic theory. Write down Gauss's law for electric fields in integral form defining all the terms in the equation. [5 marks]

(c) What is the differential form of Gauss's law for electric fields, also for a vacuum. [5 marks]

(d) Explain the meaning of each form of Gauss's law in words. [5 marks]
- (a) With the aid of diagram, explain Newton ring experiment and state two applications of Newton's Ring experiment. [5 marks]

(b) With the help of a suitable diagram, derive a mathematical expression from the Lloyd's mirror experiment to show that the phase difference: $\Phi = \frac{2\pi dy}{2x} - \pi$ [5 marks]



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(c) Derive a mathematical expression for the width (β) of interference fringes obtained in Young's double slit experiment with the help of a suitable diagram [5 marks]

(d) In a double-slit arrangement separated by $d = 0.5$ mm, with the distance between the slits and the screen is 200 cm, wavelength is 1500 nm, and vertical from center O is $y = 6.0$ cm. (a) What is the path difference Δx for the rays from the two slits arriving at point P? (b) Express this path difference in terms of λ . (c) Does point P correspond to a maximum, a minimum, or an intermediate condition? [5 marks]