



**NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES**

DEPARTMENT OF PURE AND APPLIED SCIENCE

2020_2 EXAMINATIONS

COURSE CODE: PHY 306
COURSE TITLE: OPTICS II
CREDIT UNIT: 2
TIME ALLOWED: (2 HRS)

INSTRUCTION: *Answer question 1 and any other three questions*

QUESTION 1

- a. List the two classified categories of diffraction limited system and what does the resolution ability of diffraction-limited system depends on. **4 marks**
- b. An astronomical observatory has a 50 inch telescope. Calculate the minimum angle of resolution for this telescope. Take $\lambda=7000\text{\AA}$. **5 marks**
- c. Mention three (3) similarities and difference each between Zone plate and convex lens **5marks**
- d. Explain the Limit of resolution and the Resolving power of an optical device. **4 marks**
- e. Calculate the dip in the resultant intensity of two $\left(\frac{\sin\beta}{\beta}\right)$ curves according to Rayleigh's criterion, i.e., when the maximum of one curve falls on the minimum of the other curve. **5 marks**
- f. Explain the double slit diffraction pattern. **2 marks**

QUESTION 2

- A. Highlight two examples of a body performing simple harmonic motion. **(5marks)**
- B. A particle of mass 2kg is executing simple harmonic motion, with a period of 5s and an amplitude of 8cm. One-half second after the particle has passed through its equilibrium position, what is its (a) displacement **(2. 5 marks)** (b) velocity **(2. 5 marks)** (c) acceleration **(2. 5 marks)** and (iv) its total energy of the particle at any distance y from 0? **(2. 5 marks)**

QUESTION 3

- a. From Young's Double Slit experiment, show that the fringe- width β , is given as **10 marks**

$$\beta = \frac{D}{d} \lambda$$

- b. In a two-slit interference pattern with $\lambda = 6000\text{\AA}$, the zero order and tenth order maxima fall at 15.44mm order and 17.34mm respectively. Find the fringe width. **5marks**

QUESTION 4

- a. Differentiate between Biprism and Lloyd's mirror fringes. **7marks**
- b. A convex lens inserted between the Biprism and the eyepiece gives two images of the slit in two positions. In a Fresnel's Biprism experiment, the eye piece is at a distance of 100cm from the slit. In one case, the two images of the slit are 5.05mm apart, and in the other case 3.50mm apart. If sodium light of wavelength 5893\AA is used, find the thickness of the interference fringes. **8marks.**

QUESTION 5

- a. Explain (i) Diffraction (ii) Diffracting grating. **6marks**
- b. Differentiate between constructive and destructive interference and obtain the expressions for the condition of both. **9marks**