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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

 **APRIL/MAY, 2019 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. Explain the following: (i) Constructive interference. **(3 marks)**

 (ii) Destructive interference. **(3 marks)**

b. Monochromatic light passes through two narrow slits 0.40 mm apart.

 The third-order bright fringe of the interference pattern, observed on a

 screen 1.0 meter from the slits, is 3.6 mm from the centre of the central

 maximum. What is the wavelength of the light? **(4.5 marks)**

c. (i) State two uses of interference phenomenon. **(6 marks)**

 (ii) State three principal types of measurement that can be made with **(4.5 marks)**

 Michelson interferometer:

 d. Consider a slit of width *b =* 10*λ,* 5*λ,* and *λ.* Calculate the spread of

 the central maximum. **(4 marks)**

**QUESTION 2**

a. State the difference between the Bi-prism and Lloyd's Mirror Fringes. **(5 marks)**

b. How many Fresnel zones will be obstructed by a sphere of radius 1 mm

 if the screen is 20cm away? Take = 5000 Å. **(5 marks)**

c. If the distance of the screen is increased to 200 cm, what will be the

 size of the sphere which will cut off 10 zones? **(5 marks)**

**QUESTION 3**

 a.(i) State Stoke’s principle of reversibility of light. **(3 marks)**

 (ii) Distinguish between Young double slit experiment and Michelson Interferometer.**(5 marks)**

 b. If in a Newton's ring experiment, the air in the interspaces is replaced

 by a liquid of refractive index 1.33, in what proportion would the diameters

 of the ring change? **(7 marks)**

**QUESTION 4**

 a) Show that the de Broglie wavelength λ

 

 ( **(7.5 marks)**

b) A helium-neon laser emits a diffraction-limited beam (λ= 6300 Å) of

 diameter 2 mm. What diameter of light patch would the beam produce on

 the surface of the moon at a distance of 376×103 km from the earth? You may

 neglect scattering in the earth's atmosphere. **(7.5 marks)**

**QUESTION 5**

a.(i) Define Simple harmonic motion. **(3 marks)**

 (ii) State the principle of superposition **(3 marks)**

b. A particle is executing simple harmonic motion, with a period of 3s

 and amplitude of 6 cm. One-half second after the particle has passed

 through its equilibrium position, what is its: (i) displacement? **(3 marks)**

 (ii) velocity? **(3 marks)**

 (iii) acceleration? **(3 marks)**