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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**University Village, Nnamdi Azikiwe Expressway, Plot 91, Cadastral Zone, Jabi, Abuja**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

**JANUARY/FEBRUARY 2018 EXAMINATION QUESTIONS**

**COURSE CODE: PHY306**

**COURSE TITLE:** Optics II

**COURSE UNIT: 2 units**

**TIME: 2 hours**

**INSTRUCTION: Answer *Question 1* and *any other three (3) questions***

***Question 1***

a) State the difference between the Biprism and Lloyd's Mirror Fringes. (6 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. 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? (8 marks)

c) In Fraunhofer diffraction by a circular aperture what would be done to obtain the circular aperture pattern? (3 marks)

d) Plane waves from a helium-neon laser with wavelength 6300 Å are incident on a circular

aperture of diameter 0.5 mm. What is the angular location of the first minimum in the

diffraction pattern? (8 marks)

***Question 2***

a) Mention the two classes of Interference fringes produced by thin films. (4 marks)

b) Young's experiments is performed with light of the green mercury line. If the fringes

are measured with a micrometer eyepiece 80 cm behind the double slit, it is found that 20 of them occupy a distance of 10.92 mm. Find the distance between two slits. Given that the wavelength of green mercury line is 5460 Å. (11 marks)

***Question 3***

a. (i) State Stoke’s principle of reversibility of light. (1 mark)

(ii)Explain what is meant by coherent source of light as used in the interference of light. (1 mark)

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?

(4 marks)

c. 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, (ii) velocity, and (iii) acceleration?

(9 marks)

***Question 4***

a) Distinguish between Young double slit experiment and Michelson Interferometer.

(5 marks)

b) Give an outline of how to find the wavelength of light using double slit in Young’s  
 experiment. (10 marks)

***Question 5***

a) Explain the following: (i) Constructive interference.

(ii) Destructive interference. (7 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?

(8 marks)