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)