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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**

 **OCT/NOV 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.**Highlight threedifferences between Biprism and Lloyd’s Mirror Fringes **(6marks)**

**b.** Young’s experiment is performed with light of the green mercury line. If the fringes are

measured with a micrometer earpiece 80 cm behind the double slit, it is found that 20 of them

occupy a distance of 10.92 mm. Find the distance between the two slits. Given that the

wavelength of green mercury line is 5460 Å **(6 marks)**

**c.**State whether the following statement is true or false. Give reasons: An excessive thin film

seen in reflected light appears perfectly black” **(3 marks)**

 **d.**Can there be principle maxima of zero intensity because of diffraction at each slit? If yes,

discuss. **(5 marks)**

e.Show schematically the positions of principal maxima, secondary maxima and secondary

minima for a diffraction grating with 6 slits. **(5 marks)**

**QUESTION 2**

**a.** A particle is executing simple harmonic motion, with a period of 3s and an amplitude of

6cm. One-half second after the particle has produced through its equilibrium position,

 what is its: (a) displacement**(3 marks)**

 (b) velocity**(4 marks)** and (c) acceleration **(3 marks)**

1. When one leg of a Michelson interferometer is lengthened slightly, 150 dark fringes sweep through the field view. If the light used has =480mm, how far was the mirror in that leg moved?**(5 marks)**

**QUESTION 3**

a Newton’s rings are formed in reflected light of wavelength 5895 x 10 -8 cm with a liquid between the plane and curved surfaces. The diameter of the fifth ring is 0.3 cm and the radius of curvature of the curved surface is 100 cm. Calculate the refractive index of the liquid, when the ring is: (i) bright**(5 marks)**

**(** ii) dark**(5 marks)**

b In a two- slit interference pattern with 𝜆 = 6000Å, the zero order and twentieth order fringes, other arrangements remaining the same**(5 marks).**

**QUESTION 4**

. In a Young’s two-slit experiment using light of wavelength 600 nm, the slits were 0.4 mm apart and the distance of the slits to the screen was 1.20 m

1. Find the separation of the fringes **(4marks)**
2. What is the angle in radians subtended by a central pair of bright fringes at the slits? **(4marks)**
3. A yellow line and blue line of the mercury arc spectrum have wavelengths of 5.79 × 10-7 m and 4.36 × 10-7m respectively. Calculate the angular separation of the two lines in the first and third-order spectrum formed by a grating of 5000 lines cm-1.**(7 marks)**

**QUESTION 5**

a. A 25 pence coin has a diameter of 2cm. How many Fresnel zones does it cut off if the screen is 2m away? Do you expect to see a bright spot at the centre? If we move the screen to a distance of 4m, how many zones will it cut off? Will the bright spot now too brighter? Why? Take 𝜆= 5 x 10-7 m **(9 marks)**

b. A transparent film of glass of refractive index 1.50is introduced normally in the path of one of the interfering beams of Michelson’s interferometer, which is illuminated with light of wavelength 4800. This causes dark fringes to sweep across this field. Determine the thickness of the film. **(6 marks)**