KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BSC (PHYSICS)

COURSE CODE: SPH 326

COURSE TITLE: MECHANICS

DURATION: 2 HOURS

DATE:4/10/2021 **TIME: 2:00-4:00PM**

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **3** printed pages. Please Turn Over

KIBU observes ZERO tolerance to examination cheating

Question One (30 marks)

a) State Huygen's principle (2 marks)
b) What is wave diffraction? (2 marks)
c) State the superposition Principle in waves. (2 marks)
d) Distinguish between coherent and incoherent waves. (4 marks)
e) Describe how the intensity of light varies from its source. (4 marks)
f) Define the following; (4 marks)
g) Explain what is meant by optical photometry. (4 marks)
h) Name special Conditions for a Steady Optical Interference Pattern of optical waves. (4 marks)

i) Name two sources of Phase differences and write down the conditions for both constructive and destructive interference (4 marks)

Question Two (20 Marks)

a) Describe what happens to an incident wave on a boundary between two media. (4 marks)
b) The speed and wavelength of light wave in a first medium is 2.98×10^{8} and $7.23nm$ respectively. Find the wave speed and frequency if its wavelength in the second medium is $6.03nm$. (6 marks)
c) Describe young's double slit experiment on interference of light. (10 marks)

Question Three (20 Marks)

a) What is diffraction of a wave? Use diagrams to show the effect of the size of a slit on the diffraction of a wave. (4 marks)
Diffraction is the flaring up of a wave into a region beyond the barrier
b) Laser light of wavelength 633nm is passed through a narrow slit and the diffraction pattern is observed on the screen 6m away. The distance on the screen between the centers of the first minima on either side of the central bright fringe is 32mm. How wide is the slit? (4 marks)
c) Explain the physical quantities in visual photometry. (8 marks)
d) Cite any four cases in daily life and nature where polarization occurs. (4 marks)

Question Four (20 Marks)

a) Describe any three physical properties of optical light. (6 marks)
b) A particular plane polarized electromagnetic wave, with a frequency of 100 MHz, is traveling through a vacuum in a direction we can call the x-axis. At t = 0, the electric field due to this wave at x = 0 has a magnitude of 300 V/m.
i) What is the wavelength of this wave? (3 marks)

ii) If this wave entered your eye, would you see anything? (2 marks)

iii) At t = 0 and x = 0, Find the magnitude of the magnetic field due to this wave? (3 marks)

iv) How much time passes, after t = 0, before the electric and magnetic fields at x = 0 are exactly the same as they are at t = 0? State the minimum non-zero time. (3 marks)

v) If 300 V/m represents the amplitude of the electric field in this electromagnetic wave, what is the wave's average intensity? (3 marks)

Question Five (20 Marks)

a) Distinguish between Fresnel and Fraunhofer diffraction in optics. (2 marks)

b) Explain the following terms in physical optics. (3 marks)

c) Name and give examples of the three main types of waves. (6 marks)

d) With the aid of diagrams describe the interaction of the three types of indirect light on a surface. (9 marks)