KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
RESIT EXAMINATIONS

FOR THE DEGREE OF BSC (PHYSICS)

COURSE CODE: SPH 326

COURSE TITLE: ~~MECHANICS~~ PHYSICAL OPTICS

DURATION: 2 HOURS

DATE: 18/1/2022   **TIME: 2-4PM**

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 **4** printed pages. Please Turn Over

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Question Four (20 Marks)

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

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

c) Describe the character of diffraction for different location of the observation screen. (6 marks)

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

Question Five (20 Marks)

a) What is wave diffraction? (2 marks)

b) Describe two classifications of diffraction phenomena. (8 marks)

c) Explain the principle and the experimental arrangement governing the formation of Newton rings. (6 marks)

d) Name any four conditions for interference of waves to occur. (4 marks)

Question One (30 marks)

a) State the superposition Principle in waves. (2 marks)

b) Describe what happens to an incident wave on a boundary between two media. (4 marks)

c) Distinguish between coherent and incoherent waves. (4 marks)

d) Describe how the intensity of light varies from its source. (4 marks)

e) Cite any four cases in daily life and nature where polarization occurs. (4 marks)

f) Explain what is meant by optical photometry. (4 marks)

g) Name special Conditions for a Steady Optical Interference Pattern of optical waves. (4 marks)

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

Question Two (20 Marks)

a) Distinguish between matter wave and electromagnetic wave. (2 marks)

b) Describe Fraunhofer diffraction of waves. (4 marks)

c) 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)

d) 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)

e) 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)

Question Three (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)

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

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