KIBABII UNIVERSITY

ACADEMIC YEAR……2019/2020 MAIN CAMPUS

DEPARTMENT……..OF SCIENCE TECHNOLOGY AND ENGINEERING

COURSE CODE: SPH 211

COURSE TITLE: WAVES AND OSCILLATIONS SUPPLEMENTARY PAPER

DATE: 4/02/2021 **TIME:** 2:00 - 4:00 Pm

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in ONE and ANY TWO questions from the remaining

DURATION: 2Hours

KIBABII observes ZERO tolerance to examination cheating

QUESTION ONE

(a) Differentiate between the following terms;

(i) Wave and oscillation. (2mks)

(ii) Transverse and longitudinal. (2mks)

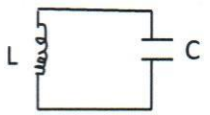
(b)State two properties of damped oscillator. (2mks)

(c) A pendulum is swinging with a frequency of 0.5Hz. What is the size and direction of acceleration when the pendulum has a displacement of 2cm to the right? (4mks)

(d) With the help of a sketch, differentiate between an under damped motion, over damped motion and critically damped motion. (6mks)

(e)Explain the characteristics of velocity in simple harmonic motion(4mks)

(f)Consider a circuit network in the figure below



(4mks)

(g) The astronomer saw hydrogen 434 spectral line of a distant star shifting to 482nm. What was the velocity of the star? (4mks)

QUESTION TWO

(a) State the SHM equation and determine acceleration of an oscillating mass attached to a spring. (10mks)

a. State the degree of freedom and explain why the car engine is said to be one degree of freedom (10mks)

QUESTION THREE

Define the following terms

(a) (i) Intensity of a wave. (3mks)

(ii) The phase. (3mks)

(iii) mechanical wave. (3mks)

(b) Give the difference between the mechanical and electromagnetic waves. (6mks)

(c) Find the speed of sound in water, which has a bulk modulus of $2.1 \times 10^{9} Nm^{-2}$ at temperature of $o^{0}c$ and a density of $1.0 \times 10^{3} kgm^{-2}$ (5mks)

QUESTION FOUR

(a)Define resonance and explain how it comes about. (10mks)

(b)State and explain three applications of Doppler Effect. (10mks)

QUESTION FIVE

(a)What do you understand by the term wave impedance? (2mks)

(ii) Below is a displacement-time graph of a wave. The velocity of the wave is 50cm/s

Determine;

(i)Amplitude

(ii) Period

(iii)Wavelength

(iv)Frequency (10mks)

(b) Show that the differential equation of a wave motion is

$$\frac{d^2y}{dt^2} = k\frac{d^2y}{dx^2}.$$ (10mks)