UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER TWO EXAMINATIONS

ACADEMIC YEAR 2023/2024

DEPARTMENT: ICT/ENGINEERING

SEMESTER: TWO

PROGRAMME(S): HIGHER EDUCATION CERTIFICATE ENGINEERING (HECE)

YEAR OF STUDY: ONE

COURSE: PHYSICS II

COURSE CODE: HECE 122

DATE: SATURDAY, 06/07/2024

TIME: 9:00 AM – 12:00 PM

DURATION: 3 HOURS

INSTRUCTIONS:

(i) This paper contains two Sections: A (40 marks) & B (60 marks).
(ii) Attempt ALL questions in Section A, and ONLY THREE questions in Section B.
(iii) All questions in Section B carry equal marks.
(iv) Credit will be given for use of relevant examples and illustrations.
(v) Begin each number in Section B on a new page of the answer sheet.
(vi) DO NOT write on this question paper.

SECTION A (20 MARKS)

Attempt **ALL** the Questions in this Section.

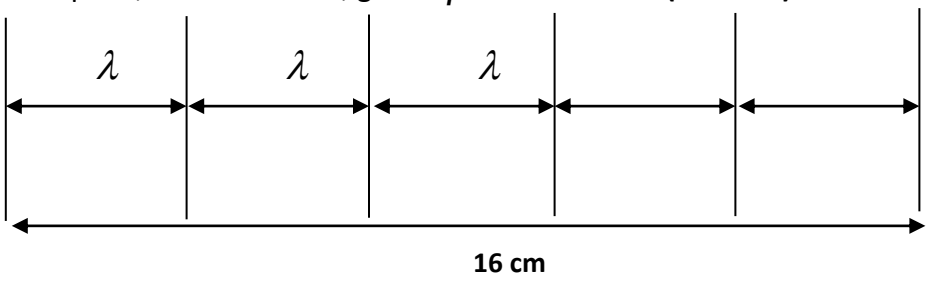
OBJECTIVES (Select the most correct answer)

1. Which of the following ways is energy transferred from one place to another
   a) Transmission b) Vibration c) Oscillation d) Wave motion
2. State an example of an electromagnetic wave
   a) Sound wave b) Water wave c) X-ray d) Light
3. Which is example of a mechanical wave
   a) Sound wave b) Radio waves c) X-ray d) Light
4. Points which have the same state of motion are to be?
   a) Motion b) Oscillation c) Simple Harmonic d) Phase
5. A wave moving from a source of disturbance to the surrounding areas as a result of which energy is transferred from one point to another is said to be?
   a) Transverse wave b) Longitudinal wave c) Water wave d) Progressive wave
6. Which of the following is NOT an example of transverse wave.
   a) Water waves b) X-ray c) Sound wave d) RF
7. As Simon blew his flute, he tuned a quite a number of frequency variation from the lowest to highest, but a fundamental frequency was defined as;
   a) Highest frequency b) Second frequency c) Middle frequency d) Lowest frequency
8. Frequencies higher than the fundamental frequencies are defined as;
   a) Harmonics b) Over tunes c) Overtones d) Tunes
9. Express the following 540 $revmin^{-1}$ in $rads^{-1}$
   a) $9\pi s^{-1}$ b) $27\ \pi s^{-1}$ c) $18\ \pi s^{-1}$ d) $36\ \pi s^{-1}$
10. Thermionic emission is the emission of electrons from the surface of a metal as a result of ——the metal.
    a) Damaging b) Vibrating c) Heating d) Breaking
11. The electron gun of CRO does not consist of the following.
    a) Grid b) Heater c) Cathode d) Anode
12. Why is tungsten used in the production of X-rays in modern physics?
    a) Hard metal b) High melting point c) Efficiency c) Reliable
13. Below is not an example of an isotopes.
    a) Chloride b) Sulphur c) Oxygen d) Carbon
14. Below is not a property of a wave.
    a) Reflection b) Refraction c) Diffraction d) Convergence
15. The unit for activity of radio-active sample is?

a) Gamma b) Activity c) Half-time d) Becquerrels

SHORT ANSWERS

1. Find Speed, V of the wave, given f = 25KH$_Z$ **(3 Marks)**



2. List the different types of Oscillations or Vibrations. **(3 Marks)**
3. Derrick as a student of Physics, was asked to describe any three properties of waves that are pivotal, outline them **(3 Marks)**
4. Explain the two types of interferences that are most occurred in Physics **(4 Marks)**
5. What is the difference between Longitudinal waves and Transverse waves. **(2 Marks)**
6. What are cathode rays, list three characteristics? **(4 Marks)**
7. State the difference between atomic number and atomic mass in quantum physics. **(2 Marks)**
8. The half-life for Radon nuclides is 3.8 days, how many days will it take for the nuclides to decay 60%, use relevant formula. **(4 Marks)**

SECTION B (20 MARKS)
Attempt **ONLY THREE** the Questions in this Section.

Question One:

a) During the progressive wave analysis, Sandra volunteered to arrange a presentation for a board meeting. Briefly explain the two main types with illustration to elaborate. **(6 Marks)**

b) Progressive wave is represented by the equation; $y = 2\sin(196t - 14.8x)$ cm

a) Frequency, f b) Wave length, λ c) Speed of the wave, V d) Speed of a particle **(8 Marks)**

c) By illustrations, define interference giving insights on Antinodal lines and Nodal lines (**6 Marks)**

Question Two:

a) A wave is represented by the equation $y = 0.1\sin\left(200\pi t - \frac{20\pi}{17}x\right)$ mm. Where y is in millimeter **(mm)**, t is time in seconds (s), x is the linear displacement from a fixed point, O in meters (m). Find;

i) The amplitude **(2 Marks)**
ii) The wave length **(2 Marks)**
iii) The speed of the wave **(2 Marks)**
iv) The frequency **(2 Marks)**

v) The phase difference in radians between a point 0.25 m and 1.10 m from O. **(3 Marks)**

b) Derive the equation of the 3rd overtone in terms of stretching Force, **F**, mass per unit length, **M** and the length, **L** of the string describing a wave motion, using illustrations were necessary. **(6 Marks)**

i) Suppose the Mass was 0.24 Kgm^{-1}, Length of 36.0 cm and Force of 25N, calculate the third, 3rd overtone. **(3 Marks)**

Question Three:

a) Briefly describe the term, Thermionic Emission and the conduction process in metals? **(4 Marks)**

b) As a student in this modern physics, Benard was required to demonstrate that an electron beam travels in a straight using Maltase Cross-Tube. **(6 Marks)**

c) Richard, an electronics Lab Technician is to set up a practical lesson for an evening class session using a **CRO** but is required to do the following;

i) The definition and what CRO stands for? **(2 Marks)**

ii) Describe its components and the three main parts using illustrations **(8 Marks)**

Question Four:

a) In Mulago hospital, many illness and major injuries are examined using X-rays. To a S.4 student as a candidate, explain briefly;

i) What are X-rays, **(2 Marks)**

ii) How are they generated using the Coolidge X-ray tube with an aid of a diagram, (**8 Marks)**

iii) At least four properties of X-rays, **(4 Marks)**

iv) **Explain** at least three most commonly application in modern technology, **(6 Marks)**

Question Five:

a) In archaeology, an ancient discovery was being done to assist a certain museum in Kenya but modern physics aspects were required in this study of **Radioactive – Decay and Half Life**. Briefly, explain what these aspect entail? **(4 Marks)**

b) By using relevant chemical formulae, illustrations, explain the three, 3 particles emitted during a radioactive decay. **(10 Marks)**

c) Briefly, give insight on the following laws in today-to-today technology;

i) Law of Radioactive Decay **(2 Marks)**

ii) Law of Radioactivity **(2 Marks)**

d) Define **Activity** of a radioactive sample and state its formula. **(2 Marks)**