CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

CHUKA & EMBU

FIRST YEAR EXAMINATION FOR AWARD OF CERTIFICATE IN COMPUTER SCIENCE

PHYS 00111: FUNDAMENTALS OF PHYSICS

STREAMS: CERT (COMP. SCI)   **TIME: 2 HOURS**

DAY/DATE: FRIDAY 26/03/2021   **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS: Answer questions ONE and any other TWO questions.

Take;

$g = 9.8ms^{-2}$
$c = 3. \times 10^8 m/s$

QUESTION ONE

a.   Differentiate between accuracy and precision..   (2 marks)

b.   Soccer fields vary in size. A large soccer field is 115 m long and 85 m wide. What is its area in (i) square feet and (ii) square inches? (Assume that 1 meter equals 3.281 feet. And 1feet = 12 inches)   (4 marks)

c.   State the three Newton laws of motion, giving the mathematical equation for each of them.   (6 marks)

d.   Tectonic plates are large segments of the Earth's crust that move slowly. Suppose that one such plate has an average speed of 4.0 cm/ year.

       (i) What distance does it move in 1 µs at this speed?

       (ii) What is its speed in kilometers per million years?   (4 marks)

e.   List the six types of simple machines   (3 marks)

f.   What are the three states of static equilibrium?   (3 marks)

g. Draw the sketch of a fiber optic cable and label the main parts. Hence state two of it's applications (3 marks)

h. Write the lens equation. (1 marks)

i. A car is traveling at a speed of 33 m/s .If it is mto be stopped in 8s,

  (i) What is the acceleration required?

  (ii) What would be the force required assuming that the vehicle weighs 800Kg? (4 marks)

QUESTION TWO

a. Using the graphical method, find the resultant of the following two displacements, 2.0m at 40° and 4.0m at 127°, the angles being taken relative to the + x-axes. (6 marks)

b. Calculate the components of a unit vector that lies in the *xy*-plane and makes equal angles with the positive directions of the *x*- and *y*-axes. (4 marks)

c. Compute the scalar and vector products of **A** and **B** given that **A**= 3**i** - 5**j** – 4**k** and **B**= 4**i** - 7**j** + 12**k** (10 marks)

QUESTION THREE

a. At the end of a race, a runner decelerates from a velocity of 9.00 m/s at a rate of 2.00 m/s2 .

  (i) How far does she travel in the next 5.00 s?

  (ii) What is her final velocity?

  (iii) Evaluate the result. Does it make sense? (10 marks)

b. Calculate the displacement and velocity at times of

  (i) 0.500s,

  (ii)1.00s,

  (iii) 1.50s,

  (iv) 2.00s, and

  (v) 2.50 s for a rock thrown straight down with an initial velocity of 14.0 m/s from the Verrazano Narrows Bridge in New York City. The roadway of this bridge is 70.0 m above the water (10 marks)

QUESTION FOUR

a.   A graph of position versus time for a certain particle moving along the *x*-axis is shown in Figure 1 below. Find the average velocity in the time intervals from

(i) 0 to 2.00 s, (ii) 0 to 4.00 s, (iii) 2.00 s to 4.00 s, (iv) 4.00 s to 7.00 s, and

(v) 0 to 8.00 s.
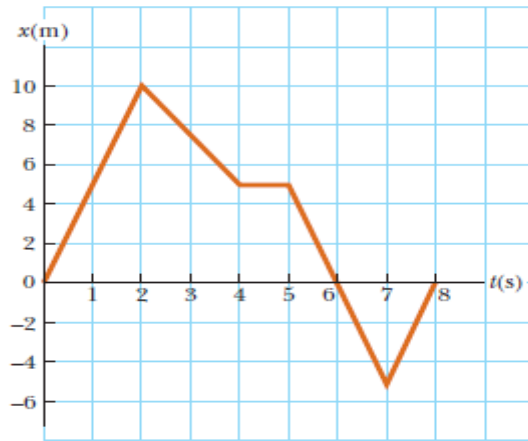

Figure 1   (10 marks)

b.   A doctor examines a mole with a 15.0-cm focal length magnifying glass held 13.5 cm from the mole. (i) Where is the image? (ii) What is its magnification? (iii) How big is the image of a 5.00 mm diameter mole?   (10 marks)

QUESTION FIVE

a.   List one optical and one magnetic computer storage devices. For each, briefly explain how data is stored and retrieved from the device.   (8 marks)

b.   A light ray entering an optical fiber surrounded by air is first refracted and then reflected as shown in **Figure 2**. Show that if the fiber is made from crown glass, any incident ray will be totally internally reflected.
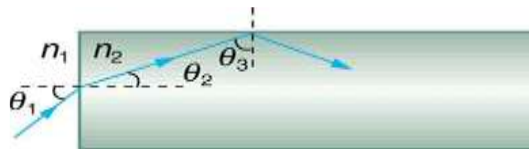

Figure 2 A light ray enters the end of a fiber, the surface of which is perpendicular to its sides. Examine the conditions under which it may be totally internally reflected.

(8 marks)

c.   A 2.00-cm-high object is placed 3.00 cm in front of a concave mirror. If the image is 5.00 cm high and virtual, what is the focal length of the mirror?   (4 marks)