CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

CHUKA/EMBU CAMPUS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN COMPUTER SCIENCE

PHYS 00111: FUNDAMENTALS OF PHYSICS

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

DAY/DATE: FRIDAY 13/12/2024 **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS:

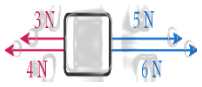
- **Answer Question One in Section A and any other Two Questions in Section B**
- **Do not write anything on the question paper**
- **This is a closed book exam, No reference materials are allowed in the examination room**
- **There will be No use of mobile phones or any other unauthorized materials**
- **Write your answers legibly and use your time wisely**
- **You may use the data below**

$g=9.8m/s^2$
$c=3.0\times10^8m/s$

QUESTION ONE (30 MARKS)

a) State the three newton laws of motion (6 marks)

b) Find the resultant force of the forces acting on a point object shown below. Indicate the direction of the resultant force. (3 marks)



c) What are the three states of static equilibrium (3 marks)

d) Differentiate between vector quantity and scalar quantity giving two examples for each (4 marks)

e) What is the KE of a 1500 kg car going at suburban speed of 14 m/s (3 marks)

f) Suppose a car merges into freeway traffic on a 200-m-long ramp. If its initial velocity is 10.0 m/s and it accelerates at 2.00 m/s^2 , how long does it take to travel the 200 m up the ramp? (4 marks)

g) Fill the table below (4 marks)

Quantity	**SI unit**
	kelvin
	candela
Amount of substance	
Electric currents	

h) Define force, give its SI unit and show how it is represented. (3 marks)

QUESTION TWO (20 MARKS)

a. Calculate the time in seconds taken a by body moving with a uniform speed of 360km/h to cover a distance of 3,000 km? (2 marks)

b. Define the term displacement (1mark)

c. Two objects are kept at different heights, first object is at 5meters and second object is placed at 15 meters. Which object has more Potential energy if the first object is 5 times heavier than the second?

(4 marks)

d. A stone is thrown from the top of a building with an initial velocity of 20.0 m/s straight upward, at an initial height of 50.0 m above the ground. The stone just misses the edge of the roof on its way down, Determine

i. The time needed for the stone to reach its maximum height, (2 Marks)

ii. The maximum height, (2 Marks)

iii. The time needed for the stone to return to the height from which it was thrown and the velocity of the stone at that instant, (3 Marks)

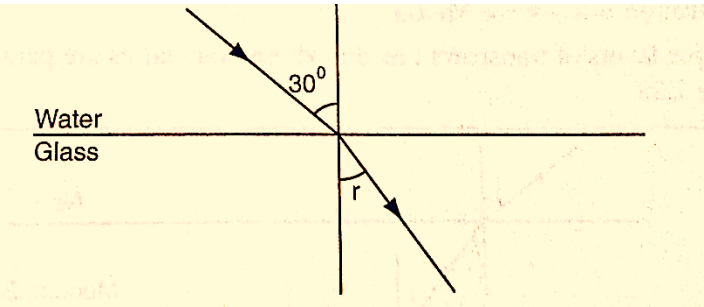
iv. The time needed for the stone to reach the ground, and (2 Marks)

v. The velocity and position of the stone at t= 5.00 s. (4 Marks)

QUESTION THREE (20 MARKS)

a. Explain the dual nature of light and state when each of them is exhibited. (3 marks)

b. A ray of light is incident on a water-glass interface as shown. Calculate 'r'. (Take the refractive index of glass and water as 3/2 and 4/3 respectively) (4 marks)



c. What do you understand by the following terms:

   i. Focal length.

   ii. Principal axis. (3 marks)

d. Define the term critical angle and hence state the conditions for total internal reflection to take place. (3 marks)

e. State the laws of refraction (2 marks)

f. Draw the sketch of a fiber optic cable and label the main parts. Hence list two other examples of optical instruments. (4 marks)

g. The magnification produced by a plane mirror is +1. What does this mean (1 mark)

QUESTION FOUR (20 MARKS)

a. Define the term energy and hence state and explain five sources of energy. (6 marks)

b. Differentiate between renewable and non-renewable energy, giving two examples for each. (4 marks)

c. A box has a mass of 5.8kg. The box is lifted from the garage floor and placed on a shelf. If the box gains 145J of Potential Energy, how high is the shelf? (4 marks)

d. A simple lever is designed such that a force of 30N moves the effort arm a distance of 10m and raises a load of 90N by 2m, calculate for:

   i. Mechanical advantage (M.A). (2 marks)

   ii. Velocity ratio (V.R). (2 marks)

   iii. Efficiency of the machine. (2 marks)

QUESTION FIVE (20MARKS)

a. A motorboat moves 80m due south in 8 seconds, then 60m due east in 2 seconds. Determine:

   i. The total distance moved by the body. (1 marks)

   ii. The displacement of the body. (2 marks)

   iii. The average speed of the body. (2 marks)

   iv. The average velocity of the body. (2 marks)

b. State the law of conservation of energy. Hence list four forms of energy (3 marks)

c. Define the following terms giving the mathematical expression for each of them.

   i. Potential energy (2 marks)

   ii. Kinetic energy (2 marks)

   iii. Power (2 marks)

d. A jet lands on an aircraft carrier at a speed of 63 m/s

   i. What is its acceleration (assumed constant) if it stops in 2.0 s due to an arresting cable that snags the jet and brings it to a stop? (2 Marks)

   ii. If the jet touches down at position x_i 5 0, what is its final position? (2 Marks)

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