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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KPH 101 – PHYSICS I

Date: 16TH AUGUST 2023
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

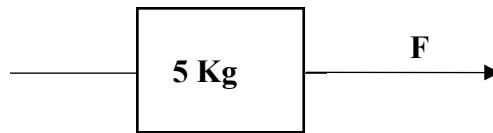
QUESTION ONE (30 MARKS)

- a) The following are commonly used electrical components. Describe the role of each one of them (6 Marks)
- i) Fuse
 - ii) Light Emitting Diode (LED)
 - iii) Integrated Circuit (IC)
- b) You have a power supply and a LED bulb connected on one side. Which electrical component can connect to this circuit to control the amount of electricity entering the LED bulb and prevent it from burning out due to overload? How will this component prevent the bulb from burning? (4 Marks)
- c) State the following laws
- i) Hooke's law
 - ii) Ohms's Law (4 Marks)
- d) A 3-kg rock swings in a circle of radius 5 m. If its constant speed is 8 m/s, what is the centripetal acceleration? (4 Marks)
- e) A 0.50 m long guitar string, of cross-sectional area $1.0 \times 10^{-6} \text{m}^2$, has a Young's modulus of 2.0×10^9 Pa. By how much must you stretch this guitar string to obtain a tension of 10 N? (4 Marks)
- f) With a well labelled diagram, explain critical angle as used in refraction of light rays from one medium to another. (4 Marks)
- g) Differentiate between of static friction and kinetic friction forces. (4 Marks)

QUESTION TWO (20 MARKS)

- a) Differentiate the following
- i) Stress and Strain
 - ii) Shear deformation and volume deformation
 - iii) Centripetal force and centripetal Acceleration (6 Marks)
- b) A steel beam is placed vertically in the basement of a building to keep the floor above from sagging. The load on the beam is $5.8 \times 10^4 \text{N}$ and the length of the beam is 2.5 m, and the cross-sectional area of the beam is $7.5 \times 10^{-3} \text{m}^2$. Find the vertical compression of the beam. Young modulus of Steel(Y) = 200×10^9 Pa. (4 Marks)

- c) Explain any two important characteristics of friction force (4 Marks)
- d) The following object rests on a horizontal floor. The coefficient static friction is 0.4 and acceleration due to gravity is 9.8 m/s^2 .



Calculate,

- i) The maximum force of the static friction (3 Marks)
- ii) The minimum force of F (3 Marks)

QUESTION THREE (20 MARKS)

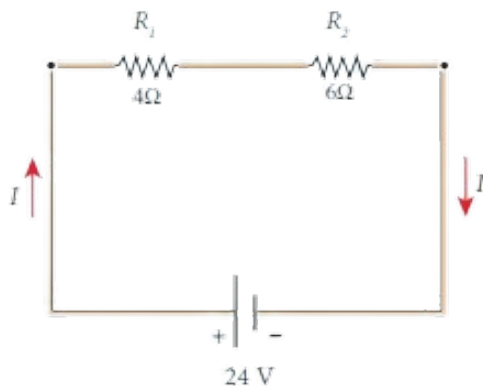
- a) Show that the total or equivalent resistance in series circuit is given by: (4 Marks)

$$R_{eq} = R_1 + R_2 + R_1 + \dots + R_{n-1} + R_n$$

- b) In an experiment measuring the current through an unknown resistor, a student obtained the following data.

Voltage (V)	Current (I)
3.0	0.151
6.0	0.310
9.0	0.448
12.0	0.511
15.0	0.750

- i) By drawing a graph on paper, show the relationship between current and voltage. (4 Marks)
- ii) Using that graph, determine the resistance of the resistor. (2 Marks)
- c) Calculate the equivalent resistance for the circuit which is connected to 24 V battery and also find the potential difference across 4Ω and 6Ω resistors in the circuit. (6 Marks)



- d) Explain a two main characteristics of friction force (4 Marks)

QUESTION FOUR (20 MARKS)

- a) Define stress. (2 Marks)
- b) Differentiate between Tensile stress and Compressive stress. (4 Marks)
- c) A skater moves with a speed of 15 m/s in a circular path of radius 30 m. The ice exerts a central force of 450 N. What is the mass of the skater? (4 Marks)
- d) A car accelerates uniformly from rest. It travels 200m in 5 seconds, how far will it travel in time 20 seconds? (6 Marks)
- e) If the car in e above has speed 10m/s at time 20 second, then what is the speed at time 40 seconds? (4 Marks)

QUESTION FIVE (20 MARKS)

a) State Snell's law.

(2 Marks)

b) Snell's law tells us that the refractive index of a material is given by the formula

$$n_2 \sin i = n_1 \sin r$$

Where in this case the light is moving from medium 1 (air) to medium 2 (glass). The refractive index of glass in air is 1.47. Calculate the expected values of values of r when the angle of incidence takes the following values: (6 Marks)

Angle of incidence (i)	Angle of reflection r
20°	
30°	
40°	

c) It is sometimes said that as light travels from a less dense medium to a denser one, the light "bends towards the normal". Use your answers above to explain what is meant by this phrase. (4 Marks)

d) A physics class has been assigned the task to determine an experimental value for the heat of fusion of ice. Student mass out 25.8 grams of ice and place it into a coffee cup with 100.0 g of water at 35.4°C. Then they place a lid on the coffee cup and insert a thermometer. After a few minutes, the ice has completely melted and the water temperature has lowered to 18.1°C. What will be their experimental value for the specific heat of fusion of ice?

Use Calorimetry Formula.

(8 Marks)