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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
FIRST YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)

KPH 2101: PHYSICS 1

DATE: 5TH DECEMBER, 2024
TIME: 8:30AM-10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE: COMPULSORY (30 MARKS)

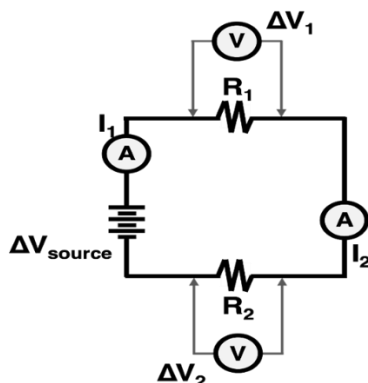
- a) An electrician wants to connect a LED bulb in a domestic wiring to a power supply.
- Which electrical component can connect to this circuit to control the amount of electricity entering the LED bulb and prevent it from burning out due to overload? **(1 Mark).**
 - How will this component prevent the bulb from burning? **(3 Marks)**
- b) Using Ohm's law formula; $V = IR$, show that the equivalent resistance for resistors connected in parallel in a circuit can be obtained by the following formula. **(6 Marks)**

$$R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)^{-1}$$

- c) A car is traveling 30 m/s and applies its brakes to stop after a distance of 150 m. How fast is the car going after it has traveled half of the distance (75 meters)? **(6 Marks)**
- d) A 6.8-Volt series circuit consists of two resistors. Resistor A has three times the resistance as resistor B. An ammeter records a current of 192 mA. Determine the resistance value of resistor A and B. **(4 Marks)**
- e) Explain the differences between the following terms as used in elasticity.
- Stress and Strain **(2 Marks)**
 - Tensile and Ultimate Strength **(2 Marks)**
 - Shear and Volume deformation **(2 Marks)**
- f) With the aid of a diagram(s), explain how converging and diverging lenses work when struck by a light ray. **(4 Marks)**

QUESTION TWO: (20 MARKS)

- a) Voltmeters can be used to determine the voltage difference between two points on a circuit. An ammeter can be used to determine the current at any given location on a circuit. The circuit at the right is powered by a 16-Volt battery and utilizes two voltmeters and two ammeters to measure voltage drops and currents. The resistor values are 2.71Ω (R_1) and 7.02Ω (R_2). Determine the ammeter readings and voltmeter readings of the diagram shown below. **(6 Marks)**



- b) A beam of light is propagating through diamond and strikes the diamond-air interface at an angle of incidence of 28 degrees.
- Explain whether part of the beam enters the air or will there be total internal reflection? **(4 Marks)**
 - Repeat part (a) assuming that the diamond is surrounded by water. **(4 Marks)**

- c) An anchor, made of cast iron of bulk modulus 60.0×10^9 Pa and a volume of 0.230 m^3 , is lowered over the side of a ship to the bottom of the harbor where the pressure is greater than sea level pressure by 1.75×10^6 Pa. Find the change in the volume of the anchor. **(6 Marks)**

QUESTION THREE: (20 MARKS)

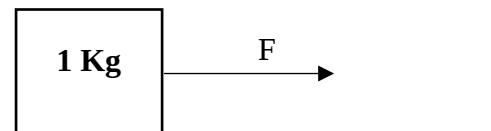
- a) State and explain two differences between concave and convex mirrors. **(4 Marks)**
- b) A rubber chicken is launched straight up at speed v from ground level. Find each of the following if the launch speed is tripled (in terms of any constants and v).
- i) Maximum height reached. **(4 Marks)**
 - ii) Air time. **(4 Marks)**
 - iii) The impact speeds. **(4 Marks)**
- c) Explain the differences between the following physical quantities giving their units of measurement.
- i) Distance and displacement. **(2 Marks)**
 - ii) Speed and Velocity. **(2 Marks)**

QUESTION FOUR: (20 MARKS)

- a) Michael has a car that accelerates at 5 m/s^2 . If the car has a mass of 1000 kg, find the force produced by the car? **(4 Marks)**
- b) Michael challenges you to a race. On the first turn you run off the course and your car strikes a large bale of hay. Your car still produces 5000 N of force, but now it accelerates at only 2 m/s^2 . Find the mass of the car when stuck to the bale of hay? **(6 Marks)**
- g) An 800 kg car goes over a hill. At the top of the hill the radius of curvature is 24 meters.
- i) If the car is traveling at a speed of 12 m/s, what is the NET force needed to keep the car following the curve of the hill? **(3 Marks)**
 - ii) What is the normal force acting on the car as it goes over the top at this speed? **(3 Marks)**
 - iii) What is the maximum speed at which a car could drive over this hill without going airborne? **(4 Marks)**

QUESTION FIVE: (20 MARKS)

- a) A car of mass 1200 kg drives around a curve with a radius of 25.0 m. If the driver maintains a speed of 20.0 km/hr, what is the force of friction between the tires and the road? What is the minimum coefficient of static friction required to keep the car in this turn? **(6 Marks)**
- b) 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? **(8 Marks)**
- c) An object rests on a horizontal floor. The coefficient static friction is 0.4 and acceleration of gravity is 9.8 m/s^2 .



Determine,

- i) The maximum force of the static friction **(4 Marks)**
- ii) The minimum force of F **(2 Marks)**