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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KPH 101 – PHYSICS I

Date: 15TH April 2024
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

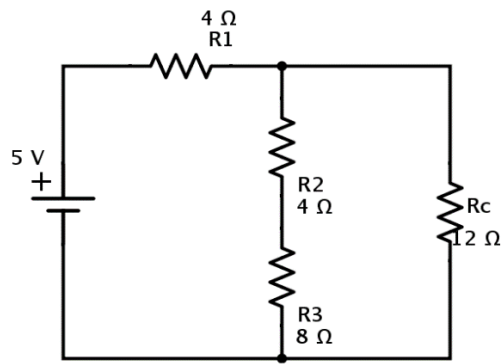
- a) Describe Integrated Circuit and give two reasons why IC's are important components in building electrical circuitry. (4 Marks)
- b) Light Emitting Diode's (LED) are commonly used in the design of modern electrical systems and devices, explain two roles of LED in an electrical device giving an example. (4 Marks)
- c) Explain the concept of calorimetry. (2 Marks)
- d) There are two types of friction forces, state and define each one of them. (4 Marks)
- e) It is very difficult to move objects with larger inertia, but there are ways to make objects with larger amounts of inertia move faster. Explain one simple way stating an example. (4 Marks)
- f) Explain the following quantities of electricity and state their SI units of measurement.
- i) Electric current
- ii) Electric voltage (4 Marks)
- g) A jogger runs down a straight stretch of road with an average velocity of 4m/s for 2 minutes. What is his final position taking his initial position to be zero? (4 Marks)
- h) A swimmer is under water and looking up at the surface. Someone holds a coin in the air, directly above the swimmer's eyes at a distance of 50 cm above the water. Find the apparent height of the coin as seen by the swimmer (assume $n = 1.33$ for water). (4 Marks)
- i) 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 $2.0 \times 10^9 \text{Pa}$. By how much must you stretch this guitar string to obtain a tension of 10 N?

QUESTION TWO (20 MARKS)

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

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

- c) The figure below shows resistors connected in both series and parallel. Use it to answer the following questions.



- i) Calculate the total or equivalent resistance (4 Marks)
- ii) Find voltage drop across R_1 (4 Marks)
- iii) Calculate the current across R_2 and R_c (4 Marks)

QUESTION THREE (20 MARKS)

- a) State the three equations of constant. (3 Marks)
- b) A car accelerates uniformly from rest. If it travels a distance D in time t , how far will it travel in time $2t$? (4 Marks)
- c) If the car in b above has speed v at time t then what is the speed at time $2t$? (3 Marks)
- d) Suppose a car merges into freeway traffic on 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? (6 Marks)
- e) An airplane lands with an initial velocity of 70.0 m/s and the accelerates at 1.50 m/s^2 for 40.0 s. what is its final velocity? (4 Marks)

QUESTION FOUR (20 MARKS)

- a) Describe the following as used in simple harmonic motion
 - i) Stress and Strain
 - ii) Ultimate strength and elastic limit
 - iii) Tensile and Comprehensive stress (6 Marks)
- b) A block of gelatin is 60 mm by 60 mm by 20 mm when unstressed. A force of .245 N is applied tangentially to the upper surface causing a 5 mm displacement relative to the lower surface. The block is placed such that 60x60 comes on the lower and upper surface.
Find the following;
 - i) shearing stress (3 Marks)
 - ii) shearing strain and (3 Marks)
 - iii) shear modulus. (2 Marks)
- c) A 5-kg object moves around a circular track of a radius of 18 cm with a constant speed of 6 m/s.
Find
 - i) The magnitude and direction of the acceleration of the object. (3 Marks)
 - ii) The net force acting upon the object causing this acceleration. (3 Marks)

QUESTION FIVE (20 MARKS)

- a) Using a well labelled diagram, explain total internal reflection in a air-glass interface. (4 Marks)
- b) A light beam 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°	

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

- c) Describe four differences between diverging and converging lenses. (4 Marks)
- d) An optical fiber consists of a core made of flint glass ($n_{\text{flint}} = 1.667$) surrounded by a cladding made of crown glass ($n_{\text{crown}} = 1.523$). A ray of light in air enters the fiber at an angle θ_1 with respect to the normal. What is θ_1 if this light also strikes the core-cladding interface at an angle that just barely exceeds the critical angle? (6 Marks)

