MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

SCU 100: PHYSICS

DATE: 2/8/2016 **TIME: 2:00 – 4:00 pm**

INSTRUCTIONS: **Answer question one and any other two**

Use: g = 9.81 ms^{-2}

Specific heat capacities of: Water = 4200 J $kg^{-1}K^{-1}$

Copper = 400 J $kg^{-1}K^{-1}$

Atomic masses for: H= 1, O = 16

SECTION A

QUESTION ONE (30MARKS)

a) Explain how a deformed body will behave when the deforming force is removed for an elastic body. (4 marks)

b) A length of copper wire of square cross-section measuring 1mm by 1mm is stretched by a tension of 40 N. Calculate the tensile stress in Pa. (5 marks)

c) Distinguish between distance and displacement. (2 marks)

d) Derive the first equation of linear motion. (4 marks)

e) A body is projected vertically upwards and reaches a height of 900 m. Calculate its initial velocity. (3 marks)

f) Define heat capacity. (2 marks)

g) A copper vessel of mass 0.1 kg has specific heat capacity 390 J kg^{-1}. Calculate its heat capacity. (3 marks)

h) A 10 V battery is connected to an ammeter, a resistor and a switch.

i) Draw a diagram of the circuit.

ii) If the ammeter reads 0.2 A, calculate the resistance of the resistor. (7 marks)

SECTION B

QUESTION TWO (20MARKS)

a) Derive an equation for the greatest height when a body is projectiled at an oblique angle (ɵ). (5 marks)

b) Show that the Range is achieved when the angle of projection is 45^0. (4 marks)

c) Explain what is meant by Centripetal force. (3 marks)

d) A body of mass 0.5 kg is whirled round a horizontal circle of radius 2.0 m with a constant speed of 10 ms^{-1}. Calculate its centripetal force. (3 marks)

e) Sketch a graph of force against extension of a non-brittle wire. On the sketch, label the main points and the elastic and plastic regions. (5 marks)

QUESTION THREE (20 MARKS)

a) Define: (i). Speed

(ii). Velocity (4 marks)

b) Derive the third equation of motion (4 marks)

c) A body changes its velocity from 20 Kmh^{-1} to30 kmh^{-1} in 60 second. Calculate the acceleration of the body in ms^{-1}. (3 marks)

d) A body is travelling at 20 ms^{-1}. This speed is maintained for 120 seconds before it decelerates uniformly to rest in 180 seconds.

i) Sketch a velocity – time graph for the journey. (5 marks)

ii) From the graph, determine the average speed (4 marks)

QUESTION FOUR (20 MARKS)

a) Using kinetic theory explain how heat is transferred in a solid. (2 marks)

b) Define the following terms.

i) Molar heat capacity

ii) Specific heat capacity

iii) Latent heat (6 marks)

c) The temperature of 400g of a certain metal is raised to 120^0C and then placed in 100g of water at 20^0C contained in a copper calorimeter of mass 200 g. If the final steady temperature rises to 28^0C, calculate the specific heat capacity of the metal. (4 marks)

d) An electric kettle which produces energy at a rate of 3000 W contains an unknown amount of water. It takes 120 seconds to heat the water from 20°C to 100°C

Calculate: i) the mass of water in kg.

ii) Molar Heat Capacity of water. (8 marks)

QUESTION FIVE (30 MARKS)

a) State the factors which the resistivity of a conductor depends. (3 marks)

b) State Ohm's Law (2 marks)

c) Derive an expression for the resistance of three conductors connected in parallel.

(4 marks)

d) Three resistors 3 Ω, 7 Ω and 12 Ω are connected in parallel to a 24 V of internal resistance 2 Ω. Calculate the current through the system. (4 marks)

e) A current of 3 A is flowing through a conductor of 4 Ω resistance. Determine the potential difference which must exist between the ends. (3 marks)

f) Define a Coulomb of charge. (2 marks)

g) A current of 3 A passes through a circuit in 4 minutes. Calculate the number of coulombs.

(2 marks)