MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

BUILDING AND CIVIL ENGINEERING DEPARTMENT

FIRST YEAR FIRST TERM EXAMINATION FOR

CERTIFICATE IN ELECRTRICAL ENGINEERING

1602/102 ELECTRICAL PRINCILES I

DATE: **TIME:**

INSTRUCTIONS: ANSWER ALL THE FIVE QUESTIONS

Answer all the questions

1. a) Define, giving examples where necessary, the following terms

   i) Derived Units
   ii) SI units
   iii) Charge
   iv) Force
   v) Electrical potential (10 marks)

   b) i) Differentiate and give corresponding units for resistance from conductance

   ii) An electric heater consumes 1.8 MJ when connected to a 250V supply for 30 minutes. Find the power rating of the heater and the current taken from the supply. (10 marks)

2. a) i) State ohms law and give its formula (4 marks)

   ii) Draw the structure of i) silicon ii) fluorine atoms (4 marks)

   b) i) Explain the following terms as applied in conductors

      I. Atomic structure
      II. Valence

III. Nucleus (6 marks)

ii) Draw the symbols for the following

I. Ammeter
II. Battery
III. Variable resistor (6 marks)

3. a) i) Find the conductance of a conductor of resistance of 8 KΩ (4 marks)

ii) Two 20Ω resistors are connected in parallel. The combination is then connected in series to a cell of 50V. Calculate

I) The total current flowing

II) The energy consumed by one resistor in 30 minutes 55 seconds by one resistor. (6 marks)

b) i) Define resistance and give its symbol (3 marks)

ii) A coil of copper wire has a resistance of 10 at 20^0C. if the temperature coefficient resistance of copper at 20^0C is 0.004/^{0}C, determine the resistance of the coil when the temperature rises to 100^0C. (7 marks)

4. a) i) Define electrical energy and state its unit. (3 marks)

ii) Give the name of the unit for i) work ii) e.m.f (2 marks)

iii) An electric kettle has a resistance of 30Ω. What current will flow when connected to a 240V source supply. Find also the power rating of the kettle. (5 marks)

b) A piece of wire of cross-sectional area 2 mm^2 has a resistance of 300 Ω. Find

i) the resistance of a wire of the same length and material if the cross-sectional area is 5 mm^2,
ii) the cross-sectional area of a wire of the same length and material of resistance 750Ω. (10 marks)

5. a) i) Define resistivity of a material and give its symbol

ii) Explain four factors that determine resistance of a material (10 marks)

b) i) Define color coding

ii) Determine the colour coding for a 47 kΩ having a tolerance of ±5%.

iii) Some copper wire has a resistance of 200 at 20◦C. A current is passed through the wire and the temperature rises to 90◦C. Determine the resistance of the wire at 90◦C, correct to the nearest ohm, assuming that the temperature coefficient of resistance is 0.004/◦C at 0◦C. (10 marks)