MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CERTIFICATE IN ELECTRICAL ENGINEERING

1602/102 ELECTRICAL PRINCILES I

DATE: 16/12/2020   **TIME: 8:30 – 11:30 AM**

INSTRUCTIONS TO CANDIDATES

Answer all the questions

1. a)   i)   State ohms law   (1 mark)

         ii)   Explain the following terms as applied in conductors

                    I.   Atomic structure
                    II.   valence   (4 marks)

    c)   i)   Four equal capacitors each of 30µF are connected in parallel.

                Calculate the effective capacitance across the network.   (4 marks)

         ii)   A capacitor of 6µF is energized by a 400V source. Determine the energy
               stored   (3 marks)

    c)   i)   Find the conductance of a conductor of resistance of 5KΩ

                                                                            (3 marks

          ii) Two 30Ω resistors are connected in parallel. The combination is then
               connected in series to a cell of 60V. If the cell has internal resistance of 5
               Ω, calculate

               i) The total current flowing

               ii) The energy consumed by one resistor in 20 minute 50 seconds by **one
               resistor**   (5 marks)

2.   a)   Define the following terms as used in electrostatics

                    i)   Capacitance
                    ii)   Electric flux intensity   (2 marks)

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b)   i)   Name **four** (4) uses of capacitors   (4 marks)

ii)   Explain the factors that determine capacitance of a capacitor

(3 marks)

c)   i)   Explain "relative permittivity" as used in capacitors.

(3 marks)

ii)   A parallel plate capacitor has a plates of $A=1000cm^2$ separated by a dielectric material of thickness 1.4mm whose $\epsilon_r=6$ the potential difference across it is 100V. Determine:-

     i)   the capacitance of the capacitor
     ii)   the charge stored
     iii)   the electric field intensity
     iv)   electric flux density   (8 marks)

3.   a)   Explain the differences between series and parallel circuits   (5 marks)

b)   A coil of wire has a resistance of 200 Ω at 0^oC. If the temperature coefficient of resistance of copper at 0^oC is 0.0043/^oC, calculate the resistance of the coil at 100^oC.   (5 marks)

c)   In the circuit below calculate:

     i)   The total current
     ii)   The voltage across the RL
     iii)   The energy dissipated by R4   (10 marks)

4.   a)   State

     i)   thee **(3)** characteristics of lines of magnetic flux
     ii)   Two factors that determine the strength of an electromagnet

(5 marks)

b)   i)   Explain with a diagram what is meant by magnetic shielding.

(3 marks)

ii)   Name four uses of electromagnetism   (4 marks)

c)   With an aid of a diagram, show the direction of magnetic field of two parallel conductors carrying current in the

     i)   Same direction
     ii)   Opposite direction   (4 marks)

d)   Draw the magnetic flux pattern of a coil carrying current.   (4 marks)

5.   a)   i)   Draw the symbols for the following

I.   Ammeter
II.   Battery   (4 marks)

ii)   Give the differences between

I.   Wet and dry cell
II.   A cell and a battery
III.   Primary and secondary cells   (6 marks)

b)   Draw and label the lanclanche dry cell   (6 marks)

c)   With a diagram and equations, explain the operations of a lead acid cell

(4 marks)