MURANG'A UNIVERSITY COLLEGE

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)

SCHOOL: ENGINEERING AND TECHNOLOGY

DEPARTMENT: MECHANICAL ENGINEERING

LEVEL: DIPLOMA **CLASS:** MRUC/ME/P/14DS

SEMESTER: II YEAR1 **JAN-APRIL 2015**

ACADEMIC YEAR: 2014/2015 **EXAM : MAIN**

UNIT: ELECTRICAL ENGINEERING SCIENCE **UNIT CODE: P1102**

DATE: 29/04 APRIL 2015 **TIME: 3 HOURS**

Instructions to candidates

This exam paper contains section `A` and `B` with five questions in total

Answer Question one (1) and any other two

You should have the following for this examination;

- Drawing instruments
- Scientific calculator
- No mobile phones allowed in the exam

SECTION `A` COMPULSORY

Q.1 a) Briefly explain the difference between metallic and covalent bonding (4 marks)

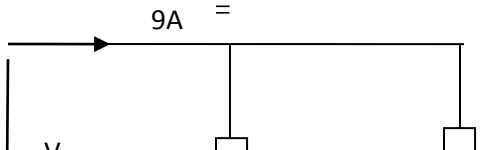
b) State Ohms law (2 marks)

c) Define the following terms as applied in electrical quantities

I. Volt.
II. Ohm.
III. Potential difference. (6 marks)

d) Determine the total resistance and the terminal voltage for the network shown in Figure 1, below (8 marks)

Fig 1



e) Explain first Faradays law as applied in electrolysis. (3 marks)

f) Briefly explain the concept of force on a single straight current carrying conductors (4 marks)

g) Explain the difference between magnetic circuit and electrical circuit. (3 marks)

SECTION B ANSWER ANY TWO QUESTION IN THIS SECTION

Q.2 a) State any four factors that affects the resistance of a conductor (4 marks)

b) With the aid of a diagram show that the total equivalent resistance of 'n' series connected resistors is given by

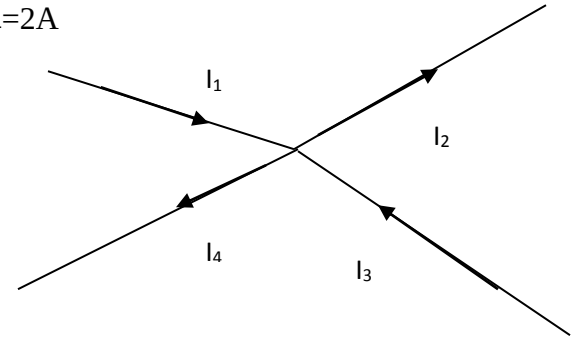
$R_S=R_1+R_2+R_3\ldots\ldots\ldots\ldots+R_n$ (5marks)

c) A series circuit containing three resistors R_1, R_2, and R_3 dissipates 20 mW when connected to 30 V supply. Calculate the p.d. across R_1 given that R_2 dissipates 10mW and the resistance of R_3 is 3KΩ (7 marks)

d) A micro computer system takes a current of 2.5A at a supply of 10v/ Calculate the daily energy consumption if it operates at 12 hours per day (4 marks)

Q.3 a) I) State Kirchhoff's law (4 marks)

ii) For the network junction shown in the figure 2 below, calculate current I_3 given that $i_1=3A$ $I_2=-4A$ and $i_4=2A$ (4 marks)

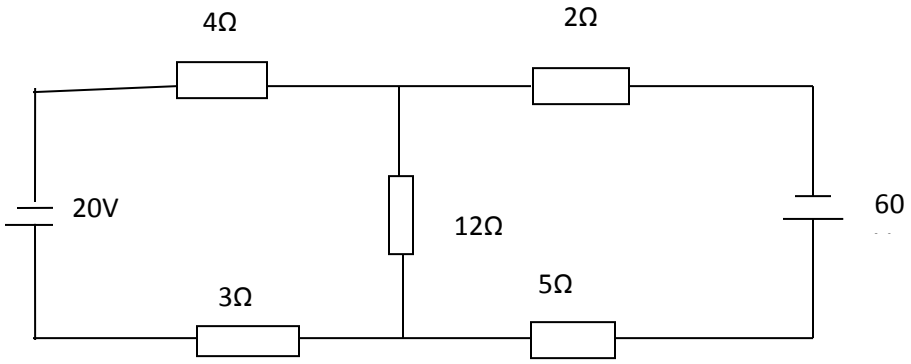


b) Explain the following types of circuit connections

I. Parallel
II. Series- Parallel (4marks)

c) Fig 3 below shows a series -parallel network. Using Kirchhoff's laws calculate

I. Current through each branch
II. P.d. across the 12Ω resistor
III. Energy absorbed by the 12Ω resistor in 40 min. (8 marks)



Q.4a) Define the following terms as used in batteries

a) Polarization
b) Local action (4 marks)

b) State

(i) Difference between primary and secondary cells.

(ii) Indication of a fully charged lead acid cell. (4marks)

(c) With the aid of a circuit diagram, explain the method of constant

Voltage, battery charging (6marks)

d) A battery of 60 cell is charged from a supply of 230V. Each cell has an e.m.f. of 2 volts at the start of charge and 2.4V at the end. If internal resistance of each cell is 0.1Ω, determine for a load of 19Ω connected in the circuit.

(i) Initial Charging current

(ii)Final charging current (4 marks)

Q5 (a) Define the following terms with reference to magnetism.

I. Relative permeability.
II. Magneto motive force (4 marks)

b) With the aid of a labeled diagram, describe a simple hysteresis loop (8 marks)

c) A steel ring has a round cross sectional area of $5cm^2$. If the mean flux length of the magnetic circuit is 50cm, find the magneto motive force required to produce a flux of 500 μWb in the iron. Take magnetic field strength of mild steel =950 A/M

(8 marks)