



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF JKUAT)

Faculty of Engineering and Technology

UKUNDA CAMPUS

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Certificate in Electric and Electronics Engineering

ENGINEERING SCIENCE

END OF SEMESTER EXAMINATION

SERIES: NOVEMBER, 2011

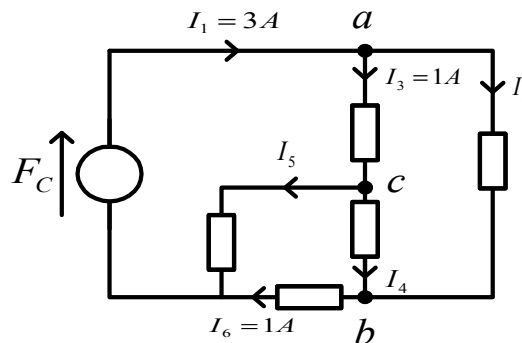
TIME: 2 HOURS

Instructions

1. You should have the following for this examination:
 - Answer Booklet
 - Scientific Calculator
2. This paper consists of **FIVE (5)** Questions.
3. Answer Question **ONE** (Compulsory) and any other **TWO** Questions.
4. This paper consists of **FOUR Printed pages**.

Question ONE

- (a) Differentiate between vector and scalar quantities and give **TWO** examples of each. (4 Marks)
- (b) (i) State Kirchoff's Law. (2 Marks)
- (ii) Write down the current relationship for the junctions a, b, and c of the network shown below and hence calculate the currents I_2 , I_4 and I_5 . (5 Marks)



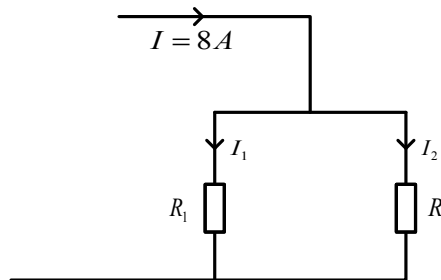
- (c) Outline the characteristics of lines of magnetic flux. (4 Marks)
- (d) Briefly explain **THREE** applications of electrolysis. (5 Marks)
- (e) (i) Name **THREE** factors affecting resistance. (3 Marks)
- (ii) A coil consist of 2000 turns of copper wire having a cross-sectional area of 0.8mm^2 . The mean length per turn in 80cm and resistivity of copper is 0.02mm at normal working temperature. Calculate the resistance of the coil. (3 Marks)
- (f) A capacitor having a capacitance of $80\mu\text{F}$ is connected across a 500V d.c. supply. Calculate the charge. (2 Marks)
- (g) A heater takes a current of 8A from a 230V source for 12h. Calculate the energy consumed in kilowatt-hours. (2 Marks)

Question TWO

- (a) State ohms law. (2 Marks)

- (b) (i) A current of 8A is shared between two resistors in the network shown below. Calculate the current in the 2Ω resistor, given that:

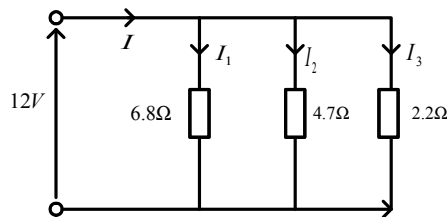
- (I) $R_2 = 2\Omega$
 (II) $R_1 = 4\Omega$



(4 Marks)

- (ii) For the network shown below, calculate the effective resistance and hence the supply current.

(6 Marks)



- (c) A 230V lamp is rated to pass a current of 0.2A. Calculate its power output. If a second similar lamp is connected in parallel to the lamp, determine the supply current required to give the same power output in each lamp.

(4 Marks)

- (d) Assuming the lamps in C above have a reasonable constant resistance regardless of operating conditions, estimate the power output if the lamps are connected in series.

(4 Marks)

Question THREE

- (a) State the **TWO** types of magnets.

(2 Marks)

- (b) Give the **THREE** types of magnetic materials and an example of each.

(6 Marks)

- (c) Outline **THREE** applications of electromagnets.

(3 Marks)

- (d) A coil of 200 turns is wound uniformly over a wooden ring having a mean circumference of 600mm and a uniform cross-sectional area of 500mm². If the current through the coil is 4.0A. Calculate:
- (i) The magnetic field strength
 - (ii) The flux density
 - (iii) The total flux
- (9 Marks)**

Question FOUR

- (a) What are the factors affecting resistivity of a material. **(3 Marks)**
- (b) Calculate the resistance of 100m length of wire having a uniform cross-sectional area of 0.1mm². if the wire is made of manganese having a resistivity of $50 \times 10^{-8}\Omega\text{m}$. **(4 Marks)**
- (c) Give **THREE** types of resistors. **(3 Marks)**
- (e) With an aid of a well labelled diagram explain the Domain theory of magnetism. **(7 Marks)**
- (f) Give **SIX** examples of non-magnetic materials. **(3 Marks)**

Question FIVE

- (a) Differentiate between a primary cell and a secondary cell. **(4 Marks)**
- (b) State **THREE** factors that determine the amount of element liberated during the process of electrolysis. **(3 Marks)**
- (c) Define the following terms:
- (i) Polarization **(2 Marks)**
 - (ii) Local action **(2 Marks)**
- (d) With an aid of a well labelled diagram explain how the lenclanche cell works. **(5 Marks)**
- (f) Give **TWO** advantages and **TWO** disadvantage of a secondary cell. **(4 Marks)**