

TECHNICAL UNIVERSITY OF MOMBASA
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

EEE 2102 ELECTRICAL ENGINEERING SCIENCE

SERIES: MAY 2016

Instructions

- This paper consists of FIVE questions
- Answer any THREE questions
- All Questions carry equal marks

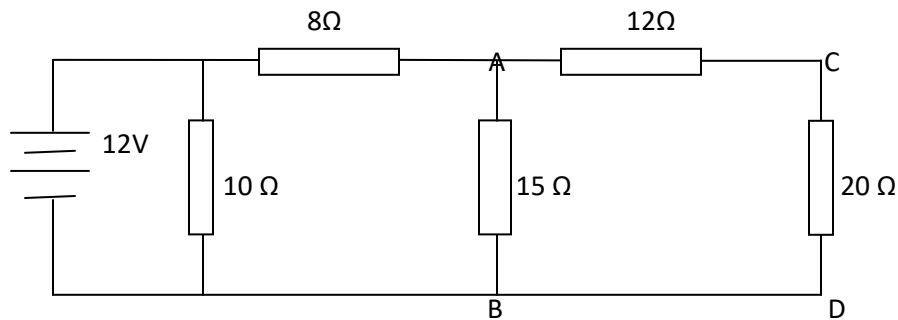
QUESTION ONE

- (a) Define the following terms
- electrochemical equivalent
 - Joule
 - Coulomb
 - Ampere
- (8 marks)
- (b) (i) Explain THREE main sources of emf
(ii) Explain the term Potential difference
- (8 marks)
- (c) State Kirchhoff's laws
- (4 marks)

QUESTION TWO

- (a) For the circuit of figure Q2a use Kirchhoff's laws to determine:
- Total resistance
 - Circuit current
 - Power
 - Energy if the current flows for 2 minutes
 - Current in branch AB
 - Pd across CD
- (12 marks)

FIGURE Q2a

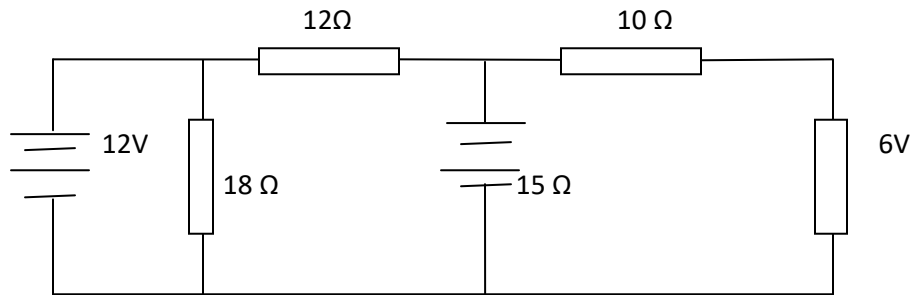


- (b) (i) Distinguish between resistivity and temperature coefficient of resistance
(ii) A coil is wound from 28m length of copper wire having a cross-sectional area of 2.5mm^2 . Calculate:
- The resistance of the coil at 0°C
 - The resistance of the coil at 85°C
- (8 marks)
- (Temperature coefficient of copper = 4.28×10^{-8} and its resistivity = 1.59×10^{-8})

QUESTION THREE

- (a) (i) State superposition theorem
 (ii) Use superposition theorem to calculate the current in each branch in the network of figure Q3a
 (10 marks)

FIGURE Q3a



- (b) With the aid of a diagram explain the construction of a lead acid cell (6 marks)
- (c) State any FOUR characteristics of lines of magnetic flux. (4 marks)
 (10 marks)

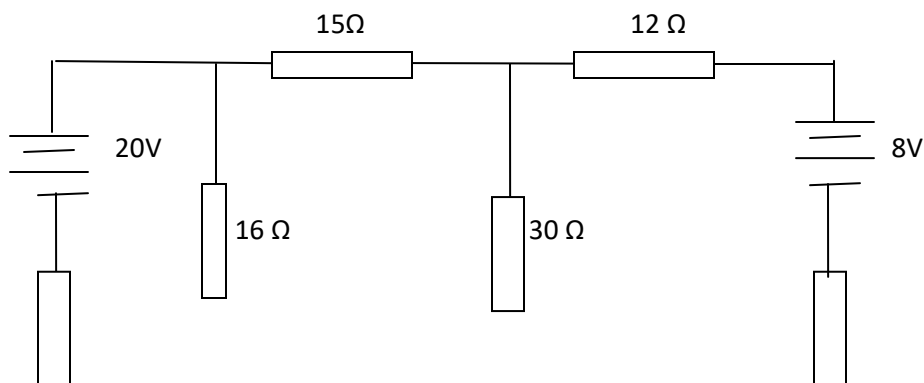
QUESTION FOUR

- (a) (i) State the following:
 i. Lenz's law
 ii. Fleming's right hand rule
 iii. Magnetic field strength
 (ii) A coil of 250 turns is wound uniformly over a wooden ring having a mean circumference of 650mm and a cross-sectional area of 3.5mm^2 . Calculate the flux density.
 (10 marks)

- (b) (i) State Thevenin's theorem
 (ii) For the circuit network of figure Q5a use Thevenin's theorem to determine the current the 20Ω

(10 marks)

FIGURE Q5a





QUESTION FIVE

(a) An alternating voltage is given by $55\sin\omega t$. Draw the sine wave and determine:

- i. Peak value
 - ii. Average value
 - iii. RMS value
 - iv. Form factor
- (7 marks)

(b) Two instantaneous voltages $V_1 = 50\sin\theta$ volts and $V_2 = 36\sin(\theta - \frac{\pi}{6})$ volts act in the same circuit.

Draw phasor diagrams and derive the expression for:

- i. The sum and
 - ii. The difference of voltages.
- (9 marks)

(c) (i) Define the following terms

- I. Capacitance
- II. Farad

(ii) Two capacitors having capacitances $8\mu\text{F}$ and $15\mu\text{F}$ are connected in parallel across a 200V supply.

Calculate

- I. The total capacitance
 - II. The charge
- (4 marks)