Technical University of Mombasa

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING (PLANT)

EEE 2140: ELECTRICAL ENGINEERING SCIENCE I

YEAR I SEMESTER I

SPECIAL/SUPPLEMENTARY EXAMINATION
February 2013 SERIES
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

- Answer booklet
- Non-programmable scientific calculator

This paper consists of **FIVE** questions

Attempt any THREE questions. Maximum marks for each part of a question are as shown.

This paper consists of 3 printed Pages

Question ONE

a) I. Define the following terms in relation to magnetic circuits
   i. Reluctance
   ii. Magnetic permeance
   II. With reference to electromagnetic induction state the two laws advanced by Michael Faraday. **(8marks)**

b) I. Explain any FOUR characteristics of magnetic flux line all magnetic materials.

II. 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 500mm^2 if the current through the coil is 4A,
Calculate:
   (i) The magnetic field strength
   (ii) The flux density
   (iii) The total flux

III. Explain any FOUR characteristics of magnetic flux lines in all magnetic materials.

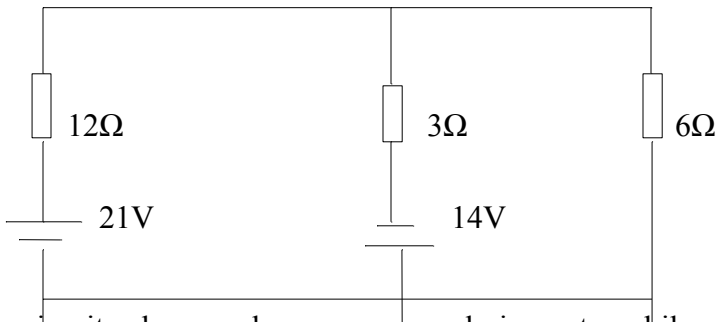
(12marks)

Question TWO

a) I. State the TWO laws of Kirchoffs as used in electrical engineering science.
   II. State the superposition Theorem as applied in electrical engineering science.

(6marks)

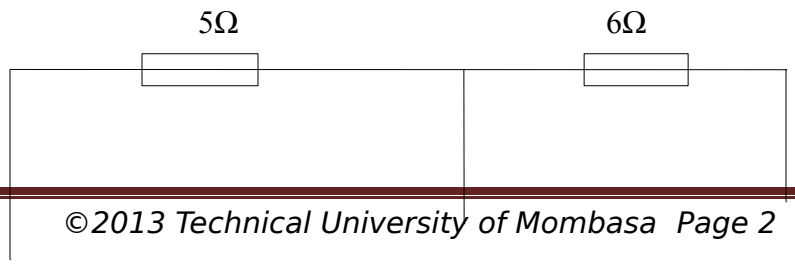
b) I.

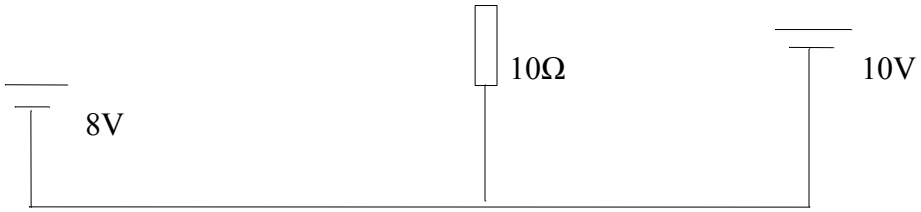


The circuit shown above was used in automobile system; by using superposition Theorem Calculate the magnitude and the direction of the current flowing through 6Ω resistor. Assume the internal resistances of the batteries to be zero. (8marks)

II. The electrical d.c network shown below was used in an engineering works; calculate the current flowing through resistor 10Ω using Kirchhoff's laws.

(6marks)





Question THREE

a) I. state any THREE methods used in battery charging

II. Explain the following terms as used in batteries and cells.

(7marks)

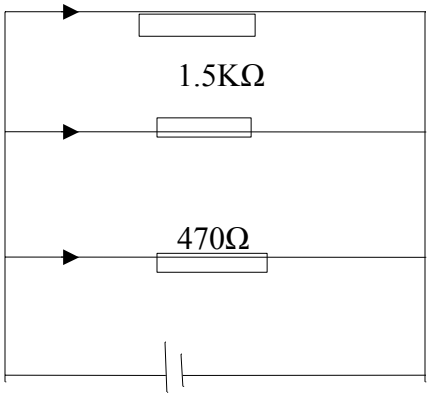
b) I. Ten cells of 1.5 volts each were connected in series to a load of 0.2Ω, the internal resistance of each battery was 0.2Ω.

Calculate:

i) The current flowing in the circuit

ii) The p.d at each battery terminal

330Ω

II. 

The circuit shown above was used instrumentation engineering circuit determine:

i) The total resistance of the network

ii) The total current of the network

iii) The current flowing in each resistor **(13marks)**

Question FOUR

a) i. Define the following units in engineering:

i) Ohms

ii) Newtons

iii) Watts

iv) Coulomb

v) Volts

ii. State any TWO fundamental quantities and THREE derived. **(10marks)**

b) I. An hydro-electric station has a turbine of efficiency of 86% and a generator of efficiency of 92%. The effective lead of the water is 150m. Calculate the volume

of water used when delivering a load of 40Mw for 6 hours the water weighs 1000Kg/m^3.

II. In an electrical industry a motor was used to drive a load of 20KN for a distance of 30metre, what is the work done by the motor? If the motor was operated for 10hours what is the power of the motor in doing the work.

(10marks)

Question FIVE

a) I. State the coulombs laws electrostatics. **(2marks)**

II. Explain the following terms as used in electrostatics

i) Electric field strength
ii) Electric field density
iii) Permittivity

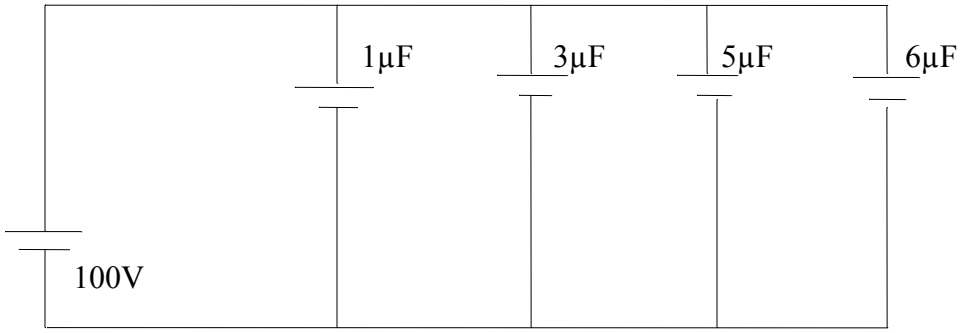
(6marks)

b) I. A ceramic capacitor has an effective plate area of 4cm2 separated by 0.1mm of ceramic of a relative permittivity of 100.

(a) Calculate the capacitance of the capacitor in PICO farads. If the capacitor in part (a) is given a change of 1.2μC what will be the pd between the plates.

(4marks)

II. The following capacitors were used to construct a telecommunication circuit, they were all connected in parallel as shown below.



i. The equivalent circuit capacitance of the circuit
ii. The total change of the circuit
iii. The total change of the circuit
iv. The change for each capacitor
v. The energy stored in the whole circuit

(8marks)