TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INFORMATON TECHNOLOGY

APS 2103: FUNDAMENTALS OF PHYSICS

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
Answer Booklet
examination pass
mathematical table or calculator
student ID
This paper consists of **FIVE** questions.
Attempt question ONE (**Compulsory**) and any other TWO questions.
This paper consists of 4 printed pages

Do not write on the question paper.

Coulomb's constant. $F_e = 8.99\times10^9\ Nm^2/C^2$

Question ONE (30mks)

a)Distinguish between intrinsic and extrinsic semiconductors. (2mks)

b) Explain why a digital signal is superior to an analog signal (2mks)

c) Define electric current and state SI unit (2mks)

d) You are driving through town at 12 m/s when suddenly a ball rolls out in front of your car. You apply the brakes and begin decelerating at 3.5 m/s/s. How far do you travel before coming to a complete stop? (3mks)

e) Define electromagnetic spectrum (1mk)

f) Explain the application of transistors (2mks)

g) Distinguish between forward bias and reverse bias connection of a diode with the aid of a diagram (4mks)

h) Explain how doping produces an n- type semi conductors from a pure semi conductor material. (3mks)

i) What is the electric potential 50 cm from a point charge q = 1 x 10^{-6} C? (3mks)

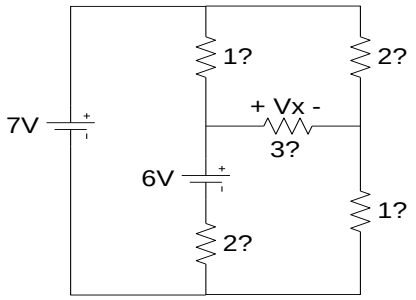
j) Define electric charge and give its SI unit (2mks)

k) Define electric field and give its SI unit (2mks)

l) Calculate the strength and the direction of the electric field E due to a point charge of 2.00nC at a distance of 5.00mm from the charge (4mks)

Question TWO (15mks)

a)Use Mesh analysis to find V_x (6mks)



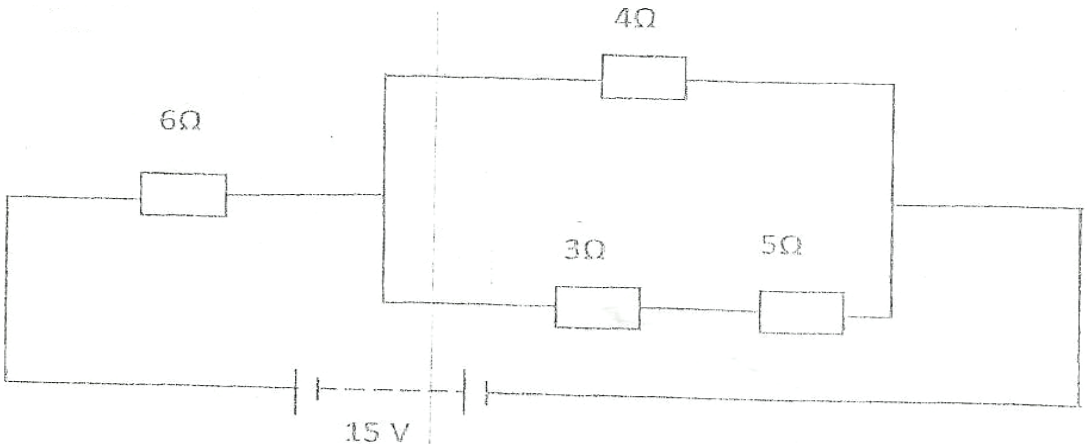
b) A 4.0, 8.0 and 12.0 Ω resistor are placed in a parallel circuit across a 24.0 V battery. What is the R_{eq} of the circuit and what is the current in each resistor? (4mks)

c) Define impendance (1mk)

d) A 60-W resistor, a 0.6 H inductor, and an 8-mF capacitor are connected in series with a 120-V, 60 Hz ac source. Calculate the impedance for this circuit. (4mks)

Question THREE (15mks)

a)The figure below shows a network of resistors connected to power supply of 15V.



Determine

(i) The effective resistance of the network (3mks)

(ii) The voltage across the 3 Ω resistor (3mks)

b) A transformer is used on a 240V a.c supply to deliver 12A at 12A to a heating coil. If 20% of energy taken from the supply is dissipated in the transformer. Calculate the current in the primary coil. (2mks)

c) A transformer with 1200 turns in the primary circuit and 120 turns in the secondary circuit has its primary circuit connected to a 400V a.c source. It is found that when a heater is connected to the secondary circuit, it produces heat at the rate of 600w. Assuming 100% efficiency, determine the:

(i) Voltage in the secondary circuit (2mks)

(ii) Current in the primary circuit (2mks)

(iii) The current in the secondary circuit (1mk)

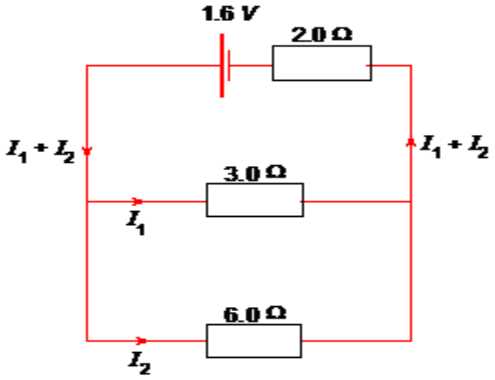
d) State two ways in which energy is lost from a transformer (2mks)

Question FOUR (15mks)

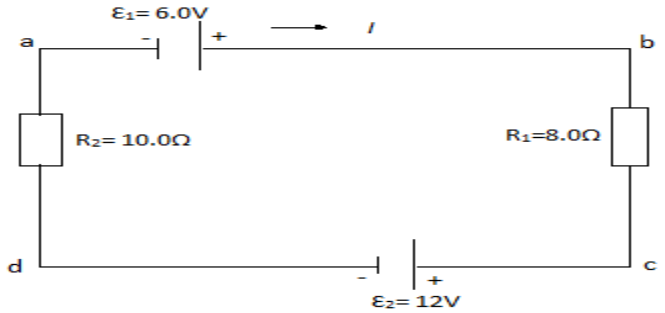
a)Two point charges are 5.0 m apart. If the charges are 0.020 C and 0.030 C, what is the force between them and is it attractive or repulsive? (3mks)

b)A particle of charge $q_1 = +6.0\mu C$ is located on the x-axis at the point $x_1 = 5.1cm$. A second particle of charge $q_2 = -5.0\mu C$ is placed on the x-axis at $x_2 = -3.4cm$. What is the absolute electric potential at the origin (4mks)

c) A circuit consists of a cell of emf 1.6 V in series with a resistance 2.0 Ω connected to a resistor of resistance 3.0 Ω in parallel with a resistor of resistance 6.0 Ω Determine the total current drawn from the cell and the potential difference across the 3.0 Ω resistor. (4mks)



d) A single loop circuit contains two resistors and two batteries as shown in the figure below. (Neglect the internal resistance of the batteries). Find the current in the circuit. (4mks)



Question FIVE (15mks)

a)Explain any four uses of E.M Spectrum: (6mks)

b) Define the following terms as used in electronic signals (3mks)

c) Explain the factors the amount of heat produced by electrical device in unit time depends on: (3mks)

d) Give various application of heating effect of electric current (3mks)

THIS IS THE LAST PRINTED PAGE