Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
200 level 1st Semester Examination – June /July 2017
SCT 251-2 Electricity and Magnetism

Uva Wellassa University

Part III

Instruction to candidates
Duration: One(1) Hour

Number of questions :3 Essays

Mark Allocation: 40 Marks

Answer Two (02) Questions only

1.

a. Name four main methods of charging material and describe two of them

(02 marks)

b. Mention the Five properties of electric field line

(03 marks)

c. What is mean by Electric dipole

(02 marks)

d. 5 mg mass drop of oil having charge q was kept in a uniform vertical upward electric field of strength $4 \times 10^4\ NC^{-1}$ at equilibrium.

I. Find the force act by electric field on this drop

(03 marks)

II. Determine the magnitude and type of the charge

(03 marks)

III. If the field direction change to downward ,find the magnitude of the acceleration of the drop

(02 marks)

e. Suppose you were installing a high-power stereo system in your car, and you wanted to build a simple filter for the "tweeter" (high-frequency) speakers so that no bass (low frequency) power is wasted in these speakers. Modify the schematic diagram shown below in figure 01 with a filter circuit of your choice:
Hint: This only requires a single component per tweeter

(05 marks)

40

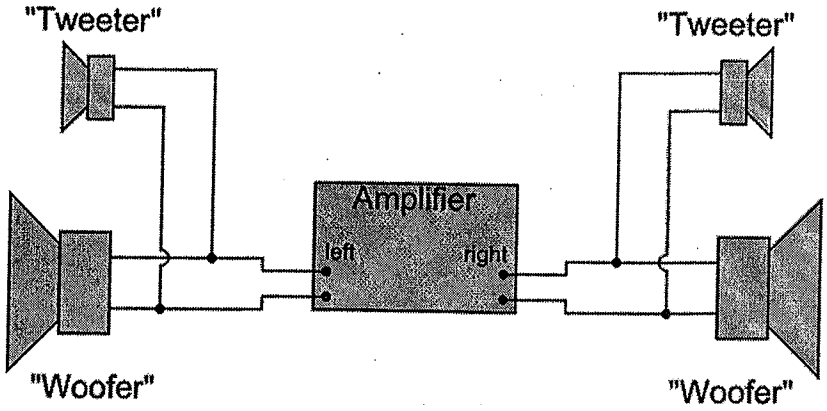

Figure 01

2.

a. Discribe Kirchhoff's junction rule.

(02 marks)

Compare and contrast multi-loop and single –loop circuits.

(04 marks)

b. A French Engineer, M.L Thevenin , made one of these quantum loops in 1893. Thevenin's Theorem is not by itself an analysis tool, but the basis for a very useful method of simplifying active circuits and complex networks because we can solve complex linear circuits and networks especially electronic networks easily and quickly. Thevenin's Theorem may be stated below:

"Any Linear Electric Network or complex circuit with Current and Voltage sources can be replaced by an equivalent circuit containing of a single independent Voltage Source V_{TH} and a Series Resistance R_{TH}."

c. I. Using Thevenin's Theorem, find the voltage and current across A and B

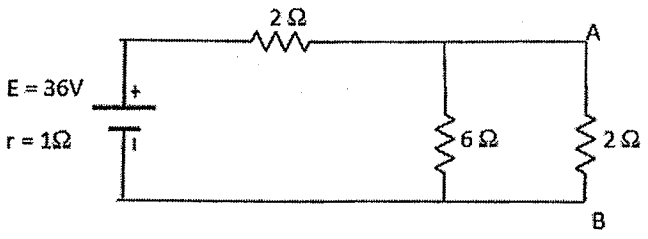

Figure 02

(08 marks)

II. Assume that we replace the 2 Ω resistor with a 10 Ω resistor across A and B of the above circuit. Find the voltage and current across A and B

(04 marks)

d. What will happen to the voltage between points A and B if the power supply voltage increases?

(02 marks)

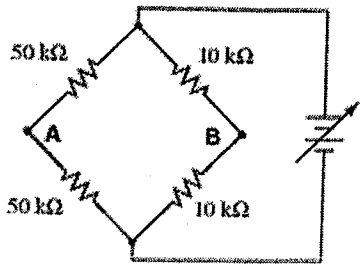

Figure 03

Moving charges (Current) create a magnetic field $\bar{B}$. $\bar{B}$ will exert a magnetic force on any other moving charge or current. The direction of the magnetic force is determined from right hand rule.

3. What's the force on a 0.1 C charge moving at velocity $\bar{V} = (10\,\hat{j} - 20\,\hat{k})\ ms^{-1}$ in a magnetic field $\bar{B} = (-3\,\hat{j} + 4\,\hat{k}) \times 10^{-4}$ T.

(05 marks)

a. Sketch the motion of positively charged particle entered in to the magnetic field going in to the paper ⊗. Suppose that magnetic force is perpendicular to the both magnetic field and velocity.

(03 marks)

b. Write down two real world applications of above particle motion.

(02 marks)

c. Particle A with charge q and mass m_A, and particle B with charge 2q and mass m_B are accelerated from rest by a potential difference ΔV. Those particles subsequently get deflected by a uniform magnetic field into semicircular paths. The radii of the trajectories by particle A and B are R and 2R, respectively. The direction of the magnetic field is perpendicular to the velocity of the particle. What is their mass ratio $\left(\frac{m_A}{m_B}\right)$?

(10 marks)