University of M 'sila

Faculty of: Technology Common Base

Forth Series Of Exercises - Phys 02

Exercise 01: Fig.01

A conducting sphere of radius R_1 = R centered in O, carry a charge – 2Q surrounded by a conducting shell with inner radius R_1 = 1.5R and outer radius R_1 = 2R carrying a charge – Q

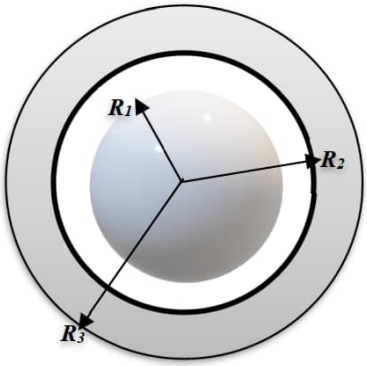

Fig .01

1/ What is the charge distribution of the shell when it is in electrostatic equilibrium

2/ Using Gauss' Law, find the electric field $\vec{E}(r)$ at everywhere in space.

3/ Deduce the potential $V(r)$ at everywhere in space.

4/ Plot $E(r)$ and $V(r)$

Exercise 02: Fig.02

4 capacitors $C_1 = 15\,\mu F$, $C_2 = 3\,\mu F$, $C_3 = 6\,\mu F$ and $C_4 = 20\,\mu F$ are connected to the voltage source of e.m.f $\mathcal{E} = 15\,V$ in the configuration of fig 02.

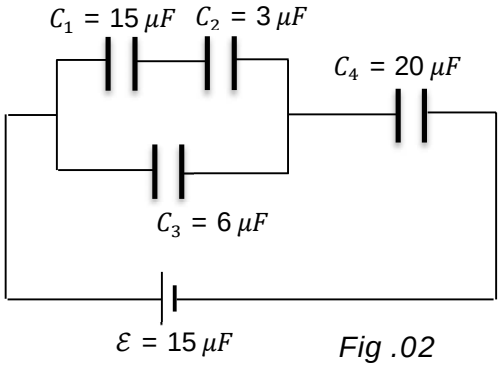

Fig .02

1/ What is the equivalent capacitance?

2/ Calculate the charge Q_i and the potential difference V_i for each capacitor.

Exercise 03: Fig.03

Let the circuit of the figure 03. Using the Kirchhoff's Law,

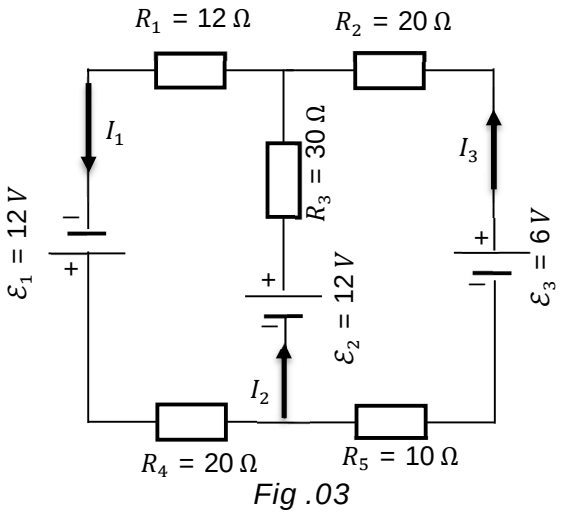

Fig .03

1/ Calculate the current in different branches.

2/ What is the potential difference for each resistor?

Exercise 04: Fig.04

Let the circuit of the figure 04. Using the Kirchhoff's Law,

1/ Calculate the current in different branches.

2/ Find is the potential difference for each resistor?

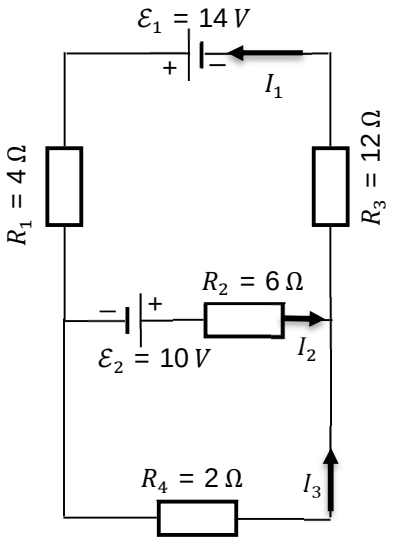

Fig .04

Exercise 05: Additional Fig.05

In the circuit of the figure 05, for capacitors $\boldsymbol{C_1 = C_3 = 1\ \mu F}$ *an* $\boldsymbol{C_2 = C_4 = 2\ \mu F}$ *are connect to the voltage source of e.m.f* $\boldsymbol{\mathcal{E} = 24\ V}$

1/ Find the equivalent capacitance, the charge and the protentional difference for each condenser in the following cases:

- *Switch S open*
- *Swich S close*

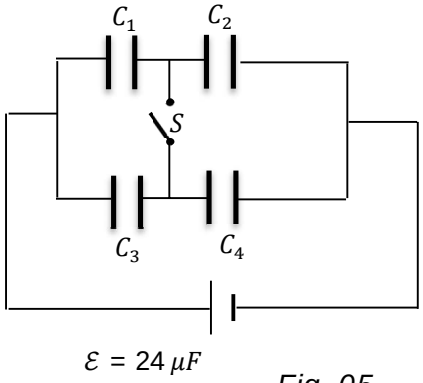

Fig .05

Exercise: 06

Five resistors $\boldsymbol{R_1 = 1\ k\Omega}$, $\boldsymbol{R_2 = R_4 = 2k\ \Omega}$, $\boldsymbol{R_3 = 4\ k\Omega}$, *and a variable resistance* $\boldsymbol{r}$, *are connected as seen in figure 06*

1/ Express the equivalent resistance as function of $\boldsymbol{r}$ *(between A and B)*

2/ What is the value of $\boldsymbol{r}$ *for which the value of equivalent resistance is equal to* $\boldsymbol{r}$*?*

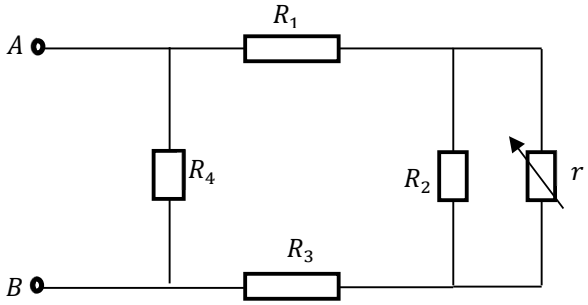

Fig .06