

TUTORIAL QUESTIONS CAPACITOR

Question 1

How much charge is stored by a $200\ \mu\text{F}$ capacitor charged up to $15\ \text{V}$? Give your answer in microcoulombs (μC) and in coulombs (C)

Question 2

What is the capacitance of a capacitor that stores $0.001\ \text{C}$ of charge when charged to $500\ \text{V}$? Give your answer in farads (F), microfarads (μF) and picofarads (pF)

Question 3

What is the average current required to charge a $50\ \mu\text{F}$ to $10\ \text{V}$ in $0.01\ \text{s}$?

Question 4

- Calculate the capacitance of two $100\ \mu\text{F}$ capacitors connected in parallel
- Calculate the charge they store when charged to a p.d. of $20\ \text{V}$

Question 5

Consider two capacitors, $C_1 = 200\ \mu\text{F}$ and $C_2 = 500\ \mu\text{F}$, charged up to a p.d. of $10\ \text{V}$. Following the steps of the argument given, calculate the charge stored by each individually and the total charge they store, and hence show that their combined capacitance when connected in parallel is $700\ \mu\text{F}$.

Question 6

Calculate the combined capacitance of a $300\ \mu\text{F}$ capacitor and a $600\ \mu\text{F}$ capacitor connected in series.

Question 7

Calculate the combined capacitance of 3 capacitors, $200\ \mu\text{F}$, $300\ \mu\text{F}$ and $600\ \mu\text{F}$, connected in series.

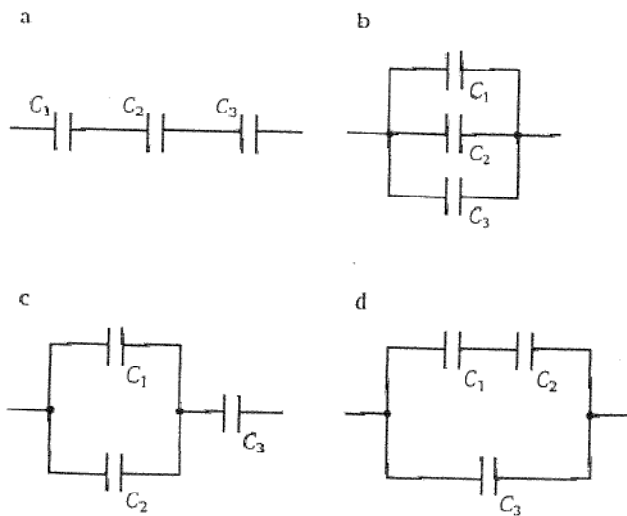
Question 8

Calculate the energy stored in each of the following cases:

- a $5000\ \mu\text{F}$ capacitor charged to $5\ \text{V}$;
- a $5000\ \text{pF}$ capacitor charged to $5\ \text{V}$;
- a $200\ \mu\text{F}$ capacitor charged to $230\ \text{V}$.

Question 9

For each of the 4 circuits shown in the figure below, calculate the combined capacitance if each capacitor has a value of $100\ \mu\text{F}$.



Question 10

A $20\ \mu\text{F}$ capacitor is charged up to $200\ \text{V}$ and then disconnected from the supply. It is then connected to a $5\ \mu\text{F}$ capacitor. Calculate:

- their combined capacitance;
- the charge they store;
- the p.d. across the combination;
- the energy dissipated when they are connected together.

Question 11

Three capacitors, of capacitance $2\ \mu\text{F}$, $6\ \mu\text{F}$ and $12\ \mu\text{F}$ are connected in series with a $12\ \text{V}$ d.c. supply. Calculate

- the total capacitance
- the charge on each capacitor
- the total energy stored

Question 12

A $10\ \mu\text{F}$ capacitor is charged by a $50\ \text{V}$ supply, and then connected across an uncharged $20\ \mu\text{F}$ capacitor. Calculate:

- the initial charge on the $10\ \mu\text{F}$ capacitor
- the final p.d. across the capacitors
- the final charge on each capacitor
- the initial energy stored
- the final energy stored

Question 13

An isolated capacitor of capacitance $200\ \mu\text{F}$ has a potential difference across it of $30\ \text{V}$.

a.) Calculate

i.) the charge stored on one plate of the capacitor.

ii.) the energy stored by the capacitor.

b.) An uncharged capacitor of capacitance $100\ \mu\text{F}$ is then connected across the charged

$200\ \mu\text{F}$ capacitor mentioned above. For this combination, state which electrical quantity

i.) will have the same total value before and after connection.

ii.) will be the same for each of the capacitors after connection.

c.) Calculate the total energy stored by the 2 capacitors after they have been connected.

Question 14

A capacitor is marked as having capacitance of $100\ \mu\text{F}$. It is also marked $20\ \text{V}$.

a.) Explain what is meant by “a capacitance of $100\ \mu\text{F}$.”

b.) How much charge is stored by the capacitor when a p.d. of $20\ \text{V}$ is applied across it?

c.) Write down the maximum charge which may safely be stored by the capacitor.

d.) Calculate the energy stored by the capacitor when charged as in (b).

e.) Suggest why the maximum voltage to be used is marked on a capacitor.

Question 15

Some capacitors are marked “ $48\ \mu\text{F}$, safe working voltage $25\ \text{V}$.” Show how a number of these capacitors may be connected to provide a capacitance

a.) $48\ \mu\text{F}$, safe working voltage $50\ \text{V}$.

b.) $72\ \mu\text{F}$, safe working voltage $25\ \text{V}$.

Question 16

Several capacitors of capacitance $10\ \mu\text{F}$. In each case, draw a diagram to show how you would connect a suitable number of these capacitors in order to obtain a capacitance of

a.) $5.0\ \mu\text{F}$

b.) $15\ \mu\text{F}$

Question 17

The capacitor shown in Fig. 17.1 has a $6\ \text{V}$ d.c. power supply and is set up with the switch open and the capacitor uncharged.

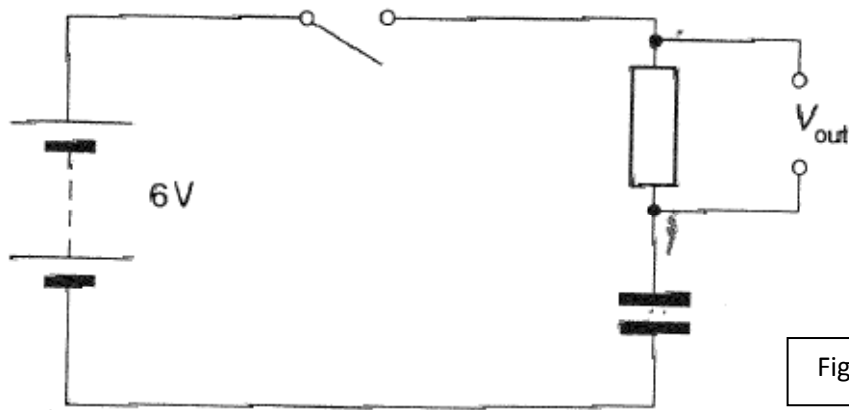


Fig. 17.1

The switch is then closed. State what is the output voltage V_{out} will be

a.) immediately the switch is closed,

b.) after a long time.