Topic 18 Capacitance

Summary

- A capacitor stores energy. Its capacitance C is given by $C = Q/V$, where Q is the charge on the capacitor when there is a potential difference V between its plates.
- A capacitor allows the storage of separated charges.
- The unit of capacitance, the farad (F), is one coulomb per volt.
- The energy stored in a charged capacitor is given by $E = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}Q^2/C$
- The equivalent capacitance C of capacitors connected in series is given by: $1/C = 1/C_1 + 1/C_2 + \ldots$
- The equivalent capacitance C of capacitors connected in parallel is given by: $C = C_1 + C_2 + \ldots$
- When a charged capacitor discharges, the charge on the plates decays exponentially. The equation for the decay is $Q = Q_0 e^{-t/CR}$
- The time constant of the circuit, given by CR, is the time for the charge to decay to 1/e of its initial value.

Definitions and formulae

- Capacitance C = charge Q/potential difference V [$C = Q/V$]
- Unit of capacitance: one Farad (F) is one coulomb per volt.
- Capacitors in parallel $C_T = C_1 + C_2$
- Capacitors in series $1/C_T = (1/C_1 + 1/C_2)$
- Energy stored in a capacitor $W = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}Q^2/C$