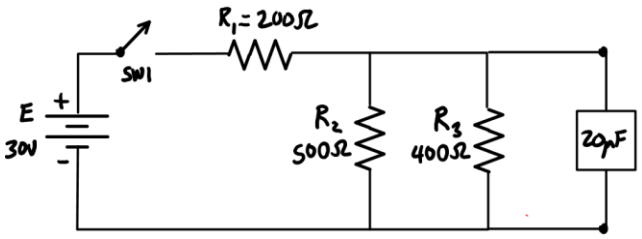
Capacitors in Series and Parallel (35:27)

Identify the formulas used to calculate the total capacitance of series arrangement of capacitors.

Identify the formula used to calculate the total capacitance of parallel arrangement of capacitors.



Given the above capacitor charging circuit determine the Thevenin's equivalent circuit seen by the 20μF capacitance.

Determine the time constant for the charging process. Determine the time necessary for a full charge.

Determine the initial conditions for V_C and I_C.

Determine the final conditions for V_C and I_C at the end of the charge process.

Derive the time variant expressions for $i_c(t)$ and $v_c(t)$ and plot these properties for a full charge.

Determine the instantaneous values for I_C and V_C at t=1.5ms.

Determine the time instantaneous voltage across the capacitor has risen to 12V. At this same time determine the instantaneous value of I_C.

Parallel Arrangement of Identical Capacitors:

Determine the behavior of the charging process and electrical properties of the system if the 20μF total capacitance in the previous circuit is a parallel arrangement of two 10μF capacitors.

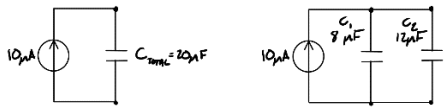
Series Arrangement of Identical Capacitors:

Determine the behavior of the charging process and electrical properties of the system if the 20μF total capacitance in the previous circuit is a series arrangement of two 40μF capacitors.

Parallel Arrangement of Unequal Capacitors:

Determine the total capacitance of a parallel arrangement of a 12µF and 8µF capacitor.

Determine the total charge transferred to this parallel arrangement of capacitors for a span of 12s.

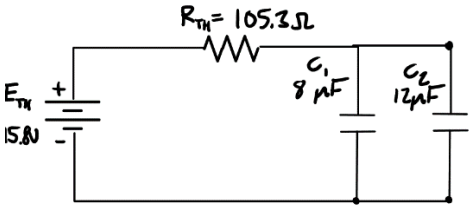


Determine the voltage across the above parallel arrangement of capacitors after a span of 12s

Determine the charge delivered to each capacitor and the total charge after a span of 12s.

Determine the current (ie: rate of charge transfer) for each capacitance over the 12s period.

Identify the formula used to calculate current through a capacitor of interest in a parallel arrangement of capacitors. Use this formula and KCL to calculate I_1 and I_2 for the above circuit given I_{IN} = 10µA.

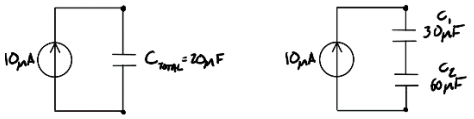


Determine the behavior of the charging process and electrical properties of the system if the 20µF total capacitance is a parallel arrangement of a 8µF and 12µF capacitor.

Series Arrangement of Unequal Capacitors:

Determine the total capacitance of a parallel arrangement of a 30µF and 60µF capacitor.

Determine the total charge transferred to this parallel arrangement of capacitors for a span of 12s.

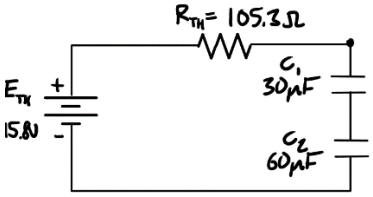


Determine the voltage across the above parallel arrangement of capacitors after a span of 12s

Determine the charge delivered to each capacitor and the total charge after a span of 12s.

Determine the voltage across each capacitance after a 12s period.

Identify the formula used to calculate voltage across a capacitor of interest in a series arrangement of capacitors. Use this formula and KVL to calculate V_1 and V_2 for the above circuit given V_{TOTAL} = 6V.



Determine the behavior of the charging process and electrical properties of the system if the 20µF total capacitance is a series arrangement of a 30µF and 60µF capacitor.

Determine V_1, I_1, V_2, and I_2 for the following configurations of capacitors given V_{TOTAL} is 20V and I_{TOTAL} is 45mA.