Basic analysis 011
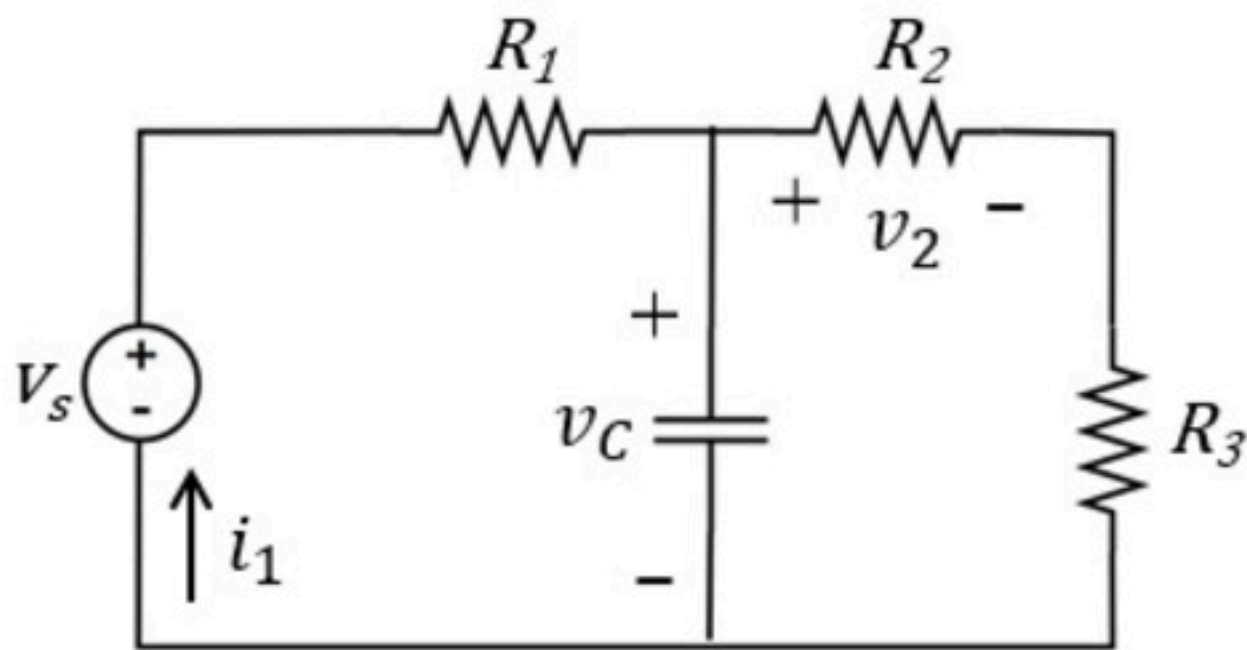
This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it.
Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
Find the coefficients A, D and E.

$$v_C = 10 - 10 \cdot e^{-20t} \ \text{V}$$

$$v_2 = A + B \cdot e^{-20t} \ \text{V} \qquad i_1 = D + E \cdot e^{-20t} \ \text{A}$$

Given Variables:

vs : 20 V
R1 : 20 ohm
R2 : 7 ohm
R3 : 13 ohm

Calculate the following:

A (.) :

B (.) :

D (.) :

E (.) :

This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it. Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
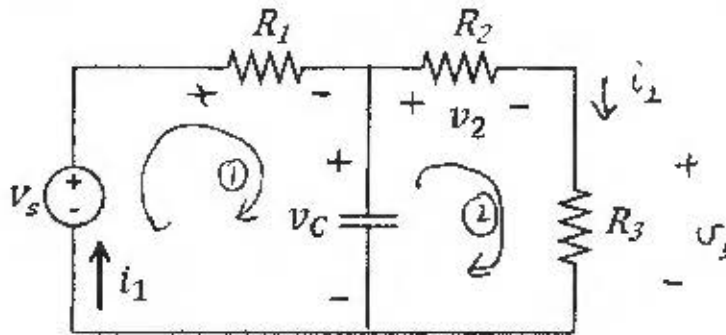Find the coefficients A, D and E.

Vs = 15 V

R1 = 10 Ω

R2 = 15 Ω

R3 = 5 Ω

$$v_C = 10 - 10 \cdot e^{-20t} \quad V$$

$$v_2 = A + B \cdot e^{-20t} \quad V \qquad i_1 = D + E \cdot e^{-20t} \quad A$$

$$KVL \text{ IN } \textcircled{1}: \quad v_s - v_{R_1} - v_c = 0 \qquad v_{R_1} = i_1 R_1$$

$$\Rightarrow \quad i_1 = \frac{1}{R_1} \cdot (v_s - v_c) = \frac{1}{10}\left(15 - 10 + 10\, e^{-20t}\right)$$

$$= \frac{1}{10}\left(5 + 10\, e^{-20t}\right)$$

$$\boxed{D = 0.5} \qquad \boxed{E = 1}$$

$$KVL \text{ in } \textcircled{2}: \quad v_c - v_2 - v_3 = 0 \qquad v_2 = i_2 \cdot R_2$$

$$v_3 = i_2 \cdot R_3$$

$$\Rightarrow v_c = v_2 + v_3 = i_2(R_2 + R_3)$$

$$\Rightarrow v_2 = R_2 \cdot i_2 = v_c \cdot \frac{R_2}{R_2 + R_3} \qquad \leadsto \quad \begin{array}{l} \text{THIS COULD ALSO} \\ \text{BE FOUND DIRECTLY} \\ \text{WITH VOLTAGE DIVIDER} \end{array}$$

$$= v_c \cdot \frac{15}{20}$$

$$\Rightarrow v_2 = 7.5 - 7.5\, e^{-20t} \qquad \boxed{A = 7.5} \quad \boxed{B = -7.5}$$