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

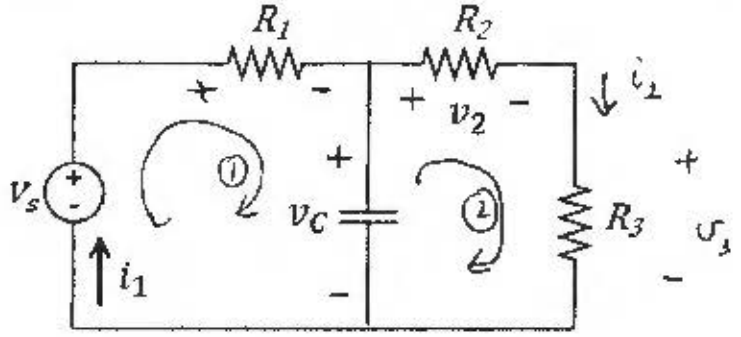
R1 = 10 Ω

R2 = 15 Ω

R3 = 5 Ω

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

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



KVL IN ① : $v_S - v_{R_1} - v_C = 0$ $\qquad v_{R_1} = i_1 R_1$

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

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

D = 0.5 **E = 1**

KVL in ② : $v_C - v_2 - v_3 = 0$ $\qquad v_2 = i_2 \cdot R_2$

$v_3 = i_2 \cdot R_3$

$$\Rightarrow \quad v_C = v_2 + v_3 = i_2\left(R_2 + R_3\right)$$

$$\Rightarrow \quad v_2 = R_2 \cdot i_2 = v_C \cdot \frac{R_2}{R_2 + R_3}$$

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

⇝ THIS COULD ALSO BE FOUND DIRECTLY WITH VOLTAGE DIVIDER

$$\Rightarrow \quad v_2 = 7.5 - 7.5\,e^{-20t}$$

A = 7.5 **B = -7.5**