

Basic concepts 002

Problem has been graded.

Determine the values of B1, B2 and B3.

The current through a circuit element is

$$\begin{aligned} i(t) &= A1 \cdot e^{\frac{t}{A2}} & \text{for } t \geq 0 \\ &= 0 & \text{for } t < 0 \end{aligned}$$

The total charge that has entered the circuit element can be represented as

$$\begin{aligned} q(t) &= B1 + B2 \cdot e^{\frac{t}{B3}} & \text{for } t \geq 0 \\ &= 0 & \text{for } t < 0 \end{aligned}$$

Given Variables:

A1 : 4 A

A2 : -3 s

Calculate the following:

B1 (C) :

B2 (C) :

B3 (s) :

The current through a circuit element is

$$i(t) = A_1 \cdot e^{\frac{t}{A_2}} \\ = 0$$

$$\text{for } t \geq 0 \\ \text{for } t < 0$$

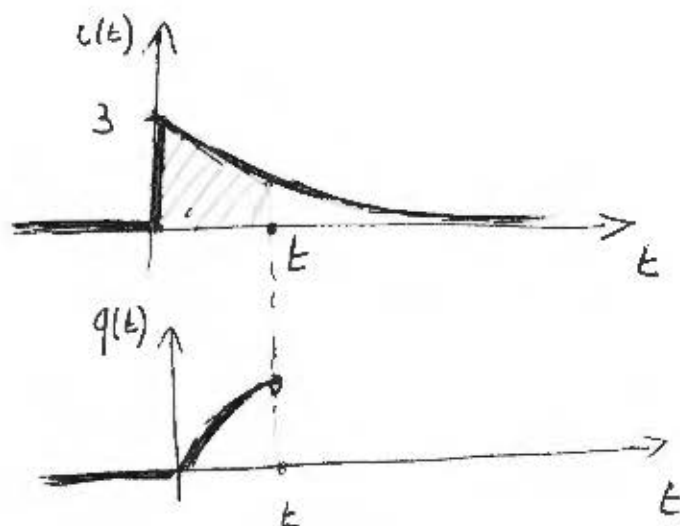
$$A_1 = 3 \text{ A}$$

$$A_2 = -2 \text{ s}$$

The total charge that has entered the circuit element can be represented as

$$q(t) = B_1 + B_2 \cdot e^{\frac{t}{B_3}} \\ = 0$$

$$\text{for } t \geq 0 \\ \text{for } t < 0$$



at any time t : $q(t)$ is the integral of $i(t)$
up until time t

$$q(t) = \int_{-\infty}^t i(u) du = \int_0^t 3 e^{-\frac{u}{2}} du \\ = 3(-2) \int_0^t e^{-\frac{u}{2}} d\left(-\frac{u}{2}\right) = -6 e^{-\frac{u}{2}} \Big|_0^t = -6 \left(e^{-\frac{t}{2}} - 1 \right)$$

$$q(t) = 6 - 6 e^{-\frac{t}{2}}$$

$$B_1 = 6 \text{ C} \\ B_2 = -6 \text{ C} \\ B_3 = -2 \text{ s}$$