

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 201 ELECTRIC CIRCUITS I

STUDENT'S NAME:	SECTION 09 (10:00 - 10:50 AM SMW)	
ID#:	QUIZ # 6 (Sat. 3 Nov., 01)	SCORE: /10

Solution

The voltage across the terminals of a $0.4 \mu\text{F}$ capacitor is $v = \begin{cases} 25 \text{ V} & t \leq 0 \\ A_1 t e^{-1500t} + A_2 e^{-1500t} & t \geq 0 \end{cases}$

The initial current in the capacitor is 90 mA.

- a. What is the initial energy stored in the capacitor ?
- b. Evaluate the coefficients A_1 and A_2 .
- c. What is the expression for the capacitor current ?

a. $W_c = \frac{1}{2} C V_0^2 = 0.2(10^{-6})(25)^2 = 125 \mu\text{J}$

b. At $t=0$, $V_0 = 25 \text{ V} \rightarrow V_0 = A_2 = 25 \text{ V}$

$$i(t) = C \frac{dv}{dt} = C e^{-1500t} [A_1 - 1500 A_1 t - 1500 A_2]$$

$$\text{At } t=0, i_0 = 0.09 \text{ A} \rightarrow i_0 = 0.4(10^{-6})[A_1 - 37500] = 0.09$$

$$\therefore A_1 = 0.375(10^5) + 2.25(10^5) = 2.625(10^5)$$

c. $i(t) = C \frac{dv}{dt} = C e^{-1500t} [A_1 - 1500 A_1 t - 1500 A_2]$

$$i(t) = 0.4(10^{-6}) e^{-1500t} [2.625(10^5)(1 - 1500t) - 37500]$$

