Chapter 7, Solution 8.

(a) $\tau = RC = \dfrac{1}{4}$

$-i = C\dfrac{dv}{dt}$

$-0.2\,e^{-4t} = C(10)(-4)\,e^{-4t} \quad\longrightarrow\quad C = \textbf{5 mF}$

$R = \dfrac{1}{4C} = \textbf{50 }\boldsymbol{\Omega}$

(b) $\tau = RC = \dfrac{1}{4} = \textbf{0.25 s}$

(c) $w_C(0) = \dfrac{1}{2}CV_0^2 = \dfrac{1}{2}(5\times10^{-3})(100) = \textbf{250 mJ}$

(d) $w_R = \dfrac{1}{2}\times\dfrac{1}{2}CV_0^2 = \dfrac{1}{2}CV_0^2\left(1 - e^{-2t_0/\tau}\right)$

$0.5 = 1 - e^{-8t_0} \quad\longrightarrow\quad e^{-8t_0} = \dfrac{1}{2}$

or $e^{8t_0} = 2$

$t_0 = \dfrac{1}{8}\ln(2) = \textbf{86.6 ms}$