

③

$$C = 0.2 \times 10^{-3} \text{ F}$$

$$V(t) = \begin{cases} 20 \text{ V} & t \leq 0 \\ (60 - 40e^{-5t}) \text{ V} & t > 0 \end{cases}$$

a) NO

b) YES

$$c) \frac{1}{2} (0.2 \times 10^{-3}) (20)^2 = \boxed{0.04 \text{ J}}$$

$$d) V(\infty) = 20 + \frac{1}{0.2 \times 10^{-3}} \int_0^{\infty} (60 - 40e^{-5t}) dt$$

$$V(\infty) = 20 + \frac{1}{0.2 \times 10^{-3}} \left[60t + 8e^{-5t} \right]_0^{\infty}$$

$$= 20 + \frac{1}{0.2 \times 10^{-3}} \left\{ \left[\infty + 0 \right] - \left[0 + 8 \right] \right\}$$

$$\boxed{V(\infty) = \infty}$$