ECSE-200 Quiz #9 (387420489[1/9] November 2018)

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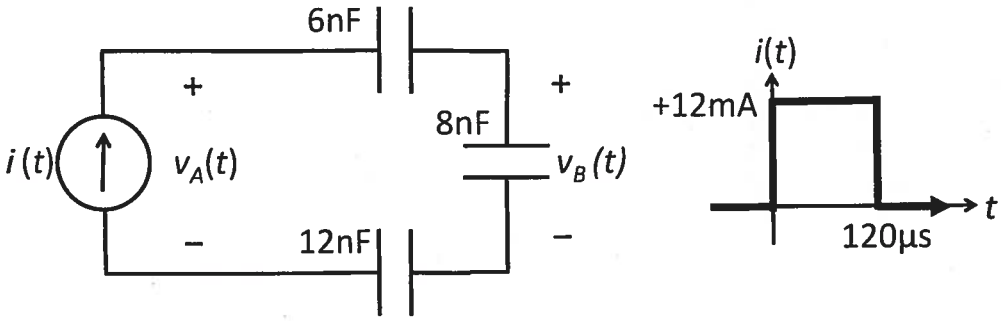
READ each question carefully. Do your work independently. SHOW ALL YOUR WORK. Give units on your answers (where appropriate).



Consider the circuit above. The capacitors store zero energy for time $t < 0$.

1) What is $v_A(0+)$? [1pt]

2) What is $v_B(0+)$? [1pt]

3) What is $v_A(120\mu s)$? [2pts]

4) What is $v_B(120\mu s)$? [2pts]

5) What is $v_A(t)$ as $t \to \infty$? [1pt]

6) What is $v_B(t)$ as $t \to \infty$? [1pt]

7) What is the maximum power that the current source delivers to the circuit? [1pt]

1) zero energy stored and capacitor voltage continuity implies $v_A(0+) = 0V$ [+1]

2) for same reason, $v_B(0+) = 0V$ [+1]

3) $C_{eq} = \left(\frac{1}{6nF} + \frac{1}{8nF} + \frac{1}{12nF}\right)^{-1} = 2\frac{2}{3}\,nF$ [+1]

$$v_A(120\mu s) = v_A(0) + \frac{1}{C_{eq}} \int_0^{120\mu s} 12mA \cdot dt = 0V + \frac{12mA \cdot 120\mu s}{2\frac{2}{3}\,nF}$$

$$= 540\,V \quad [+1]$$

4) $v_B(120\mu s) = v_B(0) + \frac{1}{8nF} \int_0^{120\mu s} 12mA\,dt = 180V$ [+2]

5) $i = 0$ for $t > 120\mu s$, thus $v_A(\infty) = 540V$ [+1] 6) $v_B(\infty) = 180V$ [+1]

7) Maximum power is delivered at $t = 120\mu s^-$

$$P_{del} = 12mA \cdot 540V = 6.48W \quad [+1]$$