Solutions

1. **[10 points]**
Find the solution, $x(t)$, to the ODE

$$2e^{-2t} = 3x(t) + 4\dot{x}(t) + \ddot{x}(t)$$

for times $t \geq 0$, with initial conditions $x(0) = 6$, $\dot{x}(0) = -6$.

(1) $5e^{-t/3} + 0.6e^{-t} - 0.4e^{-2t}$

(2) $2e^{-t} - 7e^{-2t} + e^{-3t}$

(3) $0.6e^{-t/3} + 5e^{-t} - 0.4e^{-2t}$

(4) $7e^{-t} - 2e^{-2t} + e^{-3t}$

(5) $0.5e^{-t/3} + 0.6e^{-t} - 5e^{-2t}$

(6) $e^{-t} - 7e^{-2t} + 2e^{-3t}$

(7) $0.4e^{-t/3} + 0.6e^{-t} - 5e^{-2t}$

(8) $2e^{-t} - e^{-2t} + 7e^{-3t}$

2. **[10 points]**
For the circuit below, find an expression (in volts) for the capacitor voltage labelled $v_c(t)$, for all times $t \geq 0$, assuming $v_c(0^-) = 2\,\text{V}$.

(1) $1 - e^{-t/2}$

(2) $2 - e^{-2t}$

(3) $3 - 2e^{-t/3}$

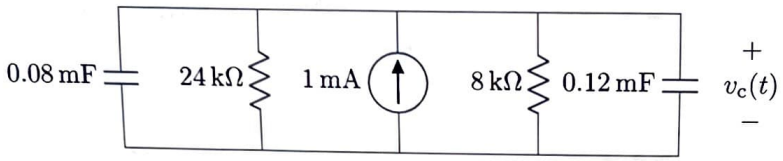
(4) $4 - 2e^{-3t/4}$

(5) $5 - 3e^{-4t/5}$

(6) $6 - 4e^{-5t/6}$

(7) $7 - 5e^{-6t/7}$

(8) $8 - 6e^{-7t/8}$



$\tau = RC = (6)(0.2) = 1.2$

0.0