Problem 1:
A current of $4 \sin 4t$ A flows through a 5F capacitor. Find the voltage $v(t)$ across the capacitor given that $v(0) = 1$ V.

Problem 2:
Determine the equivalent capacitance for each of the two circuits below.

![Circuit Diagram](image)

Problem 3:
Find the voltage across the capacitors in the circuit below under dc conditions.

![Circuit Diagram](image)

Problem 4:
A 100-mH inductor is connected in parallel with a 2kΩ resistor (source-free circuit). The current through the inductor is $i(t) = 50e^{-400t}$ mA

(a) Find the voltage $v_L$ across the inductor.
(b) Find the voltage $v_R$ across the resistor.
(c) Does $v_L + v_R = 0$? Provide a brief explanation along with yes/no.
(d) Calculate the current through the inductor at time $t = 5$ seconds.
Problem 5:
Find $v_C$ and $i_L$ in the circuit below, under dc steady-state conditions.

![Circuit Diagram](image)

Problem 6
The switch has been closed for a long time, and it opens at time $t = 0$. Find $v(t)$ for time $t \geq 0$.

![Circuit Diagram](image)

Problem 7
For the circuit below, determine $v_0(t)$ when $i(0) = 5A$ and $v(t) = 0$ (this is to practice finding only a natural response, when a forcing function is equal to 0).

![Circuit Diagram](image)
Problem 8
A circuit is described by the differential equation:

\[ 4 \frac{dv}{dt} + v = 10 \]

a) What is the time constant of this circuit?
b) What is \( v(\infty) \), the final value of \( v(t) \)?
c) If \( v(0) = 2 \), find \( v(t) \) for \( t \geq 0 \).

Note that there is a short discussion in the text on referring a 'describing equation' (i.e., the differential equation) to an actual circuit.