Chapter 10, Solution 41.

Find v_o for the circuit in Fig. 10.86 assuming that $v_s = [6\cos(2t) + 4\sin(4t)]$ V.

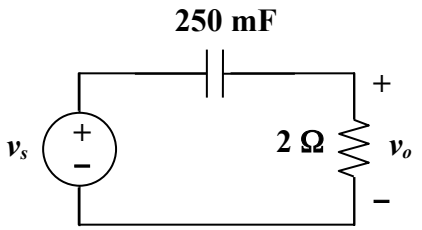


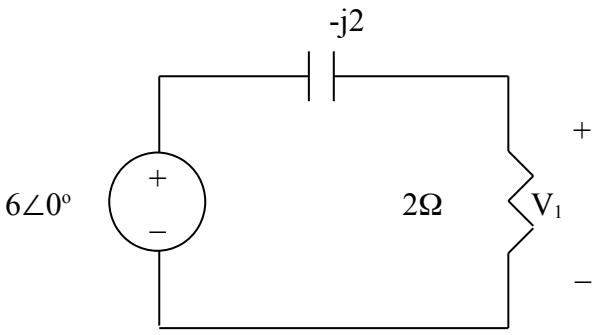
Figure 10.86
For Prob. 10.41.

Solution

We apply superposition principle. We let

$$v_o = v_1 + v_2$$

where v_1 and v_2 are due to the sources 6cos2t and 4sin4t respectively. To find v_1, consider the circuit below.



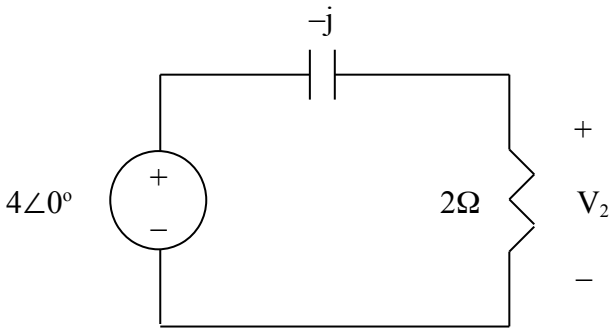
$$1/4F \longrightarrow \frac{1}{j\omega C} = \frac{1}{j2x1/4} = -j2$$

$$V_1 = \frac{2}{2-j2} V(6) = 3+j3 = 4.243\angle 45°$$

Thus,

$$v_1(t) = \mathbf{4.243\cos(2t+45°)\ volts}.$$

To get $v_2(t)$, consider the circuit below,



$$1/4F \longrightarrow \frac{1}{j\omega C} = \frac{1}{j4x1/4} = -j1$$

$$V_2 = \frac{2}{2-j}(4) = 3.2 + j11.6 = 3.578 \angle 26.57° \text{ or}$$

$v_2(t) = 3.578\sin(4t+26.57°)$ volts.

Hence,

v_o = **[4.243cos(2t+45°) + 3.578sin(4t+26.57°)] volts**.