بسمه تعالی

تمرین سری ۱ | تئوری مدار های الکتریکی | تحویل:۲٤ بهمن ۹٤

Node analysis

1. For the circuit shown in Fig. P6.1, use the node analysis to obtain the differential equation in terms of the voltage v, given the initial conditions $i_L(0) = I_0$ and $v_C(0) = V_0$.

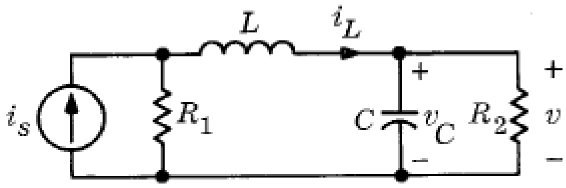

Fig. P6.1

Mesh analysis

2. For the circuit in the preceding problem, transform the current source to an equivalent voltage source, and then use the mesh analysis to obtain the differential equation in terms of the voltage v.

State equations

3. Give the state equations for the circuit in the preceding problem. Use v and i_L as state variables.

State equations

6. Write the state equations for the circuit of Fig. P6.4.

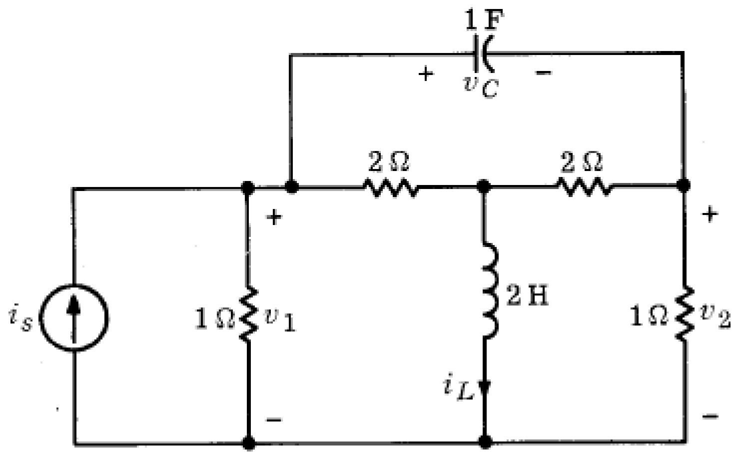

Fig. P6.4

Zero-input response, impulse response, and step response

8. Given the differential equation of a linear time-invariant circuit,

$$\frac{d^3y}{dt^3} + 4\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 2y = \frac{d^2w}{dt^2} + 3w$$

The initial conditions are

$$y(0-) = 1 \qquad \frac{dy}{dt}(0-) = 2 \qquad \frac{d^2y}{dt^2}(0-) = -1$$

Determine the zero-input response, the impulse response, and the step response.

Zero-state response and complete response

9. For Prob. 8, if the input w is a sinusoid, $w(t) = \cos t$, determine the zero-state response using two different methods. Find the complete response for the initial conditions indicated.