Analogs

See hand-out for mechanical and thermal analogs of electrical circuits

Note: Change in equation below (1/k coeff of \(x_{road}\) deleted)

Extra-credit problem (from Rizzoni) +2.5%

The mechanical system shown represents a car of:

- Mass \(m = 1,500\) kg
- Spring constant \(k = 20,000\) N/m
- Shock absorber damping \(b = (a) 15,000\) N-s/m
  & (b) 5,000 N-s/m

Subject to an abrupt displacement at \(t = 0\) of:

- \(x_{road} = 10\) cm

The differential equation is:

\[
\frac{m}{k} \frac{d^2 x_{body}(t)}{dt^2} + \frac{b}{k} \frac{dx_{body}(t)}{dt} + x_{body}(t) = x_{road}(t) + \frac{b}{k} \frac{dx_{road}(t)}{dt}
\]

- Determine and sketch the body displacement \(x(t)\) versus \(t\) for cases (a) & (b)