

HOMEWORK #10 (Chapter 3 Higher –Order Differential Equations)

1. A mass of 1 slug, when attached to a spring, stretches it 2 free and then comes to rest in the equilibrium position. Determine the equation of motion if the external force is  $f(t) = e^{-t} \sin 4t$ . Analyze the displacements for  $t \rightarrow \infty$ . (Exercises 3.8 Problem 32)
2. (a) Show that the solution of the initial-value problem  $\frac{d^2x}{dt^2} + \omega^2x = F_0 \cos \gamma t$ ,  $x(0) = 0$ ,  $x'(0) = 0$  is  $x(t) = \frac{F_0}{\omega^2 - \gamma^2} (\cos \gamma t - \cos \omega t)$ .  
(b) Evaluate  $\lim_{\gamma \rightarrow \omega} \frac{F_0}{\omega^2 - \gamma^2} (\cos \gamma t - \cos \omega t)$ . (Exercises 3.8 Problem 39)
3. Find the steady-state charge and the steady-state current in an *LRC* series circuit when  $L = 1h$ ,  $R = 2\Omega$ ,  $C = 0.25f$ , and  $E(t) = 50 \cos tV$ . (Exercises 3.8 Problem 49)