

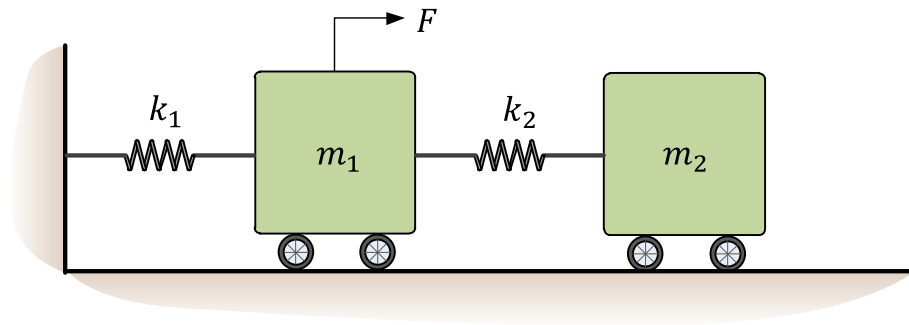
MMAN2300 Engineering Mechanics 2

Part A: Vibration Analysis

Tutorial 4

Questions 1-4

The figure below shows two train carriages connected together in series by springs. Determine the natural frequencies and mode shapes of the system for $k_1 = k_2 / 2 = k$ and $m_1 = m_2 = m$. A force $F(t) = F_o \sin(\omega t)$ is applied to carriage 1. Determine the steady-state amplitudes for each carriage and sketch the responses. At what frequency is mass m_1 stationary? What is the amplitude of mass m_2 when mass m_1 is stationary?



$$[\omega_{n_1} = 0.662\sqrt{k/m}, \frac{A_1}{A_2} = 0.78; \omega_{n_2} = 2.136\sqrt{k/m}, \frac{A_1}{A_2} = -1.28,]$$

$$A_1 = 0 \text{ when } \omega = 1.41\sqrt{k/m}, A_2 = -0.5F_o / k]$$