Answers to ES205 Exam 1, 2005

Problem 1

1.1)

a) 0.4

b) 10 rad/s

c) $$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{Bmatrix} = \begin{bmatrix} 0 & 1 \\ -100 & -8 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{bmatrix} 0 \\ 5 \end{bmatrix} \{f(t)\}$$

d) Steady state value is 0.1, time to the first peak is ½ the period = π/ω_d.

1.2) $6\dot{y} + 4y = F$

1.3) $$k_{eq} = \frac{k_{beam} k}{k_{beam} + k}$$

1.4) neglect the mass of the beam

1.5) 1/32

Problem 2

Answer not available. R_3 and R_4 do not enter the problem. I had 4 equations and 4 unknowns, but you can do it with fewer.

Problem 3

I had seven equations and seven unknowns. The biggest problem students had with this problem was not defining a coordinate at the right end of the spring connected to J_1 and not defining their systems clearly.