ME 360 EXAM 2 2008 SOLUTIONS

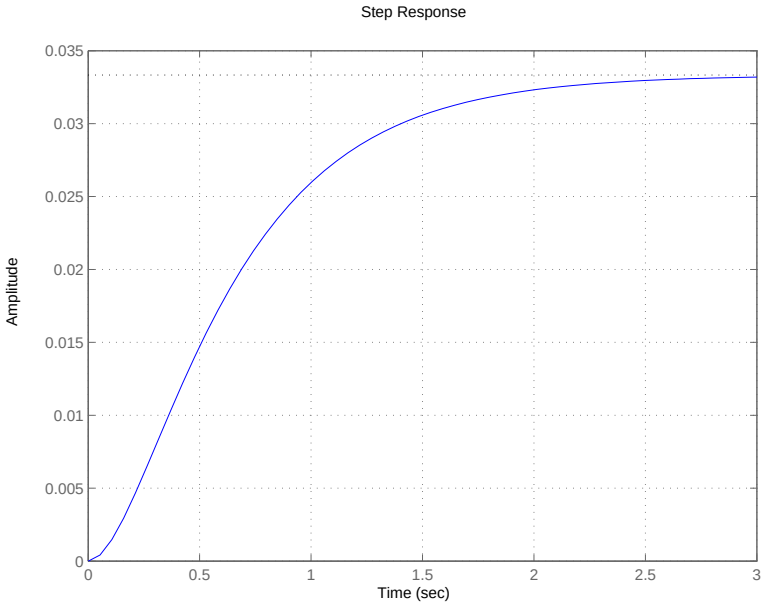
(1) (a) $x = \frac{7t^2}{10} + 3$

(b) $x = \frac{83}{20} - \frac{3e^{-5t}}{20}$

(c) $x = \frac{2t^3}{21} + 5t + 3$

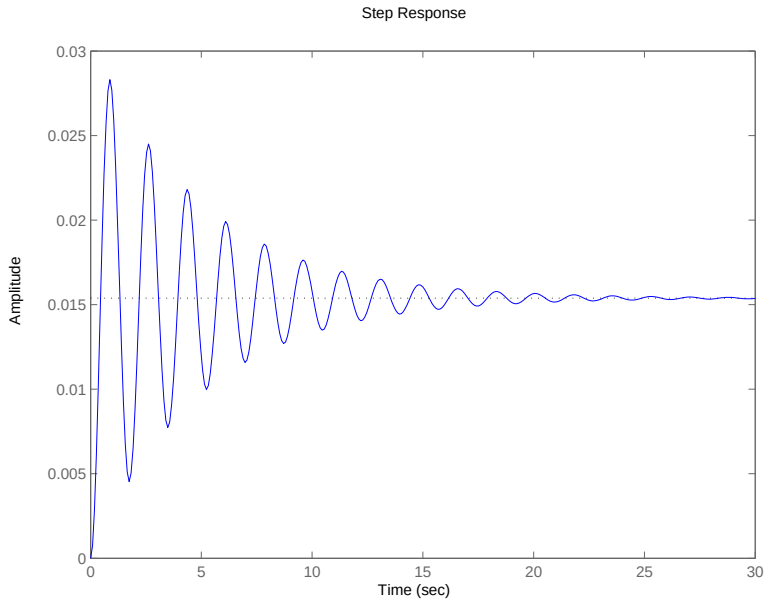
(d) $x = \frac{17t}{3} + \frac{e^{-4t}}{6} + \frac{17}{6}$

(2)
```
>> sys=tf(1,[3 21 30])

Transfer function:
        1
-----------------
3 s^2 + 21 s + 30

>> step(sys)
>> grid on
>> print -depsc2 ~/p2a.eps
```




```
>> sys=tf(1,[5 2 65])
```

```
Transfer function:
       1
----------------
5 s^2 + 2 s + 65

>> step(sys)
>> print -depsc2 ~/p2b.eps
>>
```

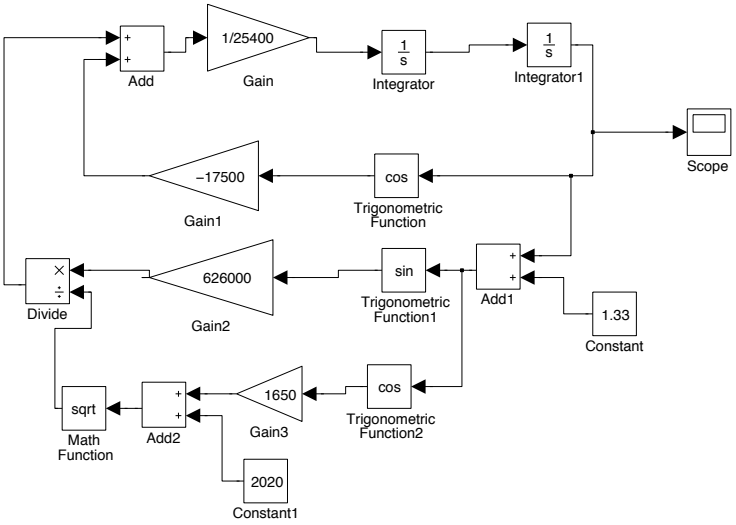


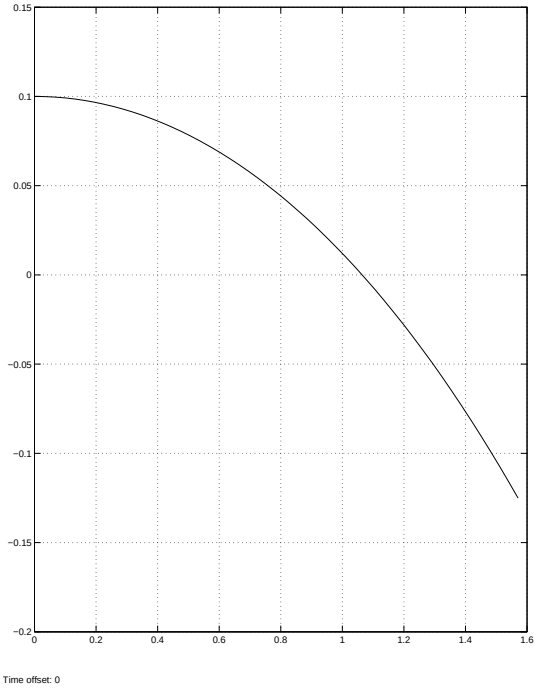
(3) (a) $A = \begin{bmatrix} -5 & 3 \\ 1 & -4 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 5 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $D = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

(b) $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3.5 & -2 & -2.5 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ .5 \end{bmatrix}$, $C = \begin{bmatrix} 0 & 1 & 0 \end{bmatrix}$, $D = \begin{bmatrix} 0 \end{bmatrix}$

(c) $A = \begin{bmatrix} 0 & 1 \\ -3.333 & -21 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $D = \begin{bmatrix} 0 \end{bmatrix}$

(4) Solution:


Add
1/25400
Gain
1
s
Integrator
1
s
Integrator1
Scope
−17500
Gain1
cos
Trigonometric Function
626000
Gain2
sin
Trigonometric Function1
Add1
1.33
Constant
Divide
sqrt
Math Function
Add2
1650
Gain3
cos
Trigonometric Function2
2020
Constant1


0.15
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Time offset: 0