Midterm Test

Name _____

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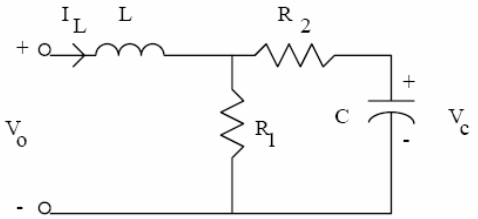
1. Solve the initial value problem using the Laplace transform (5 pnts)

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 4y = e^{-2t},\ y(0) = 0,\ y'(0) = 1.$$

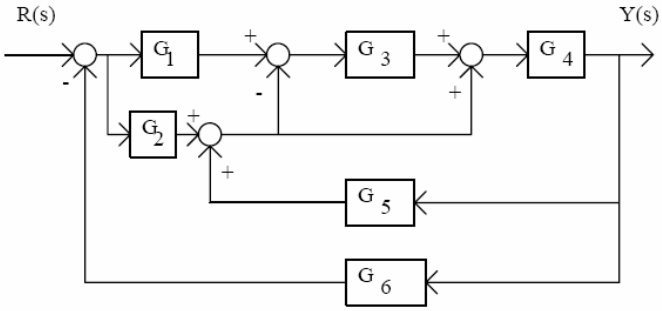
Find such that y''-y'+y=u that the poles of system will be –2 and –3. (5 pnts)

2. Given the network (6 pnts)

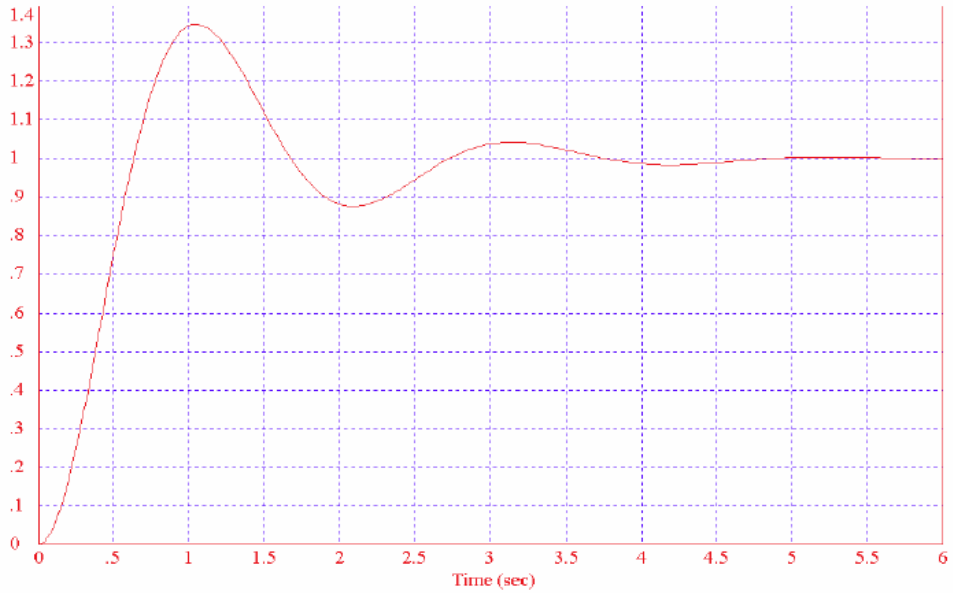


Find the transfer functions $W_1(s) = V_c(s) / V_0(s)$

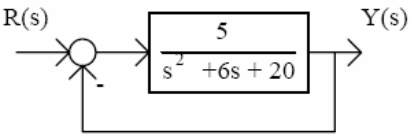
3. Using block-diagram transformations reduce given block-diagram. Identify the transfer function $W(s) = Y(s) / R(s)$. (6 pnts)



4. Given response of a prototype second order system to a unit-step function (fig.2). Identify a transfer function of this system.

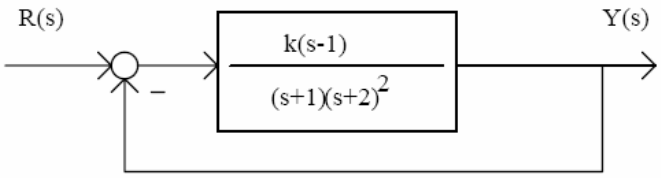


5.For given system (6 pnts)



sketch the unit step response without mathematically solving for the time response , if $r(t) = 1(t)$

6. Given the block-diagram (6 points)



Use Routh criterion of stability to calculate the range $a < k < b$ that makes the closed loop system stable if any.

1.Carefully sketch a root locus for a close- loop control system:

where $G(s) = \dfrac{K}{(s+4)^2(s+1)}$. Find the value of K for which the close-loop system is marginally stable, if any.