ANSWER SHEET

In-Class Assignment

Consider the system $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 3y = 2r(t)$ where initial conditions are y(0)=1 , $\frac{dy(0)}{dt} = 0$ and r(t)=1 t>0. a) Find Y(s), b) Time response c) steady state response from final value theorem and d) steady state response from time response

$$\frac{d^n f(t)}{dt^n} \xleftrightarrow{\mathcal{L}} s^n F(s) - s^{n-1} f(0^-) - s^{n-2} f(0^-) - \cdots - s f^{(n-2)}(0^-) - s^{n-2} f^{(n-1)}(0^-)$$

a) $[s^2 Y(s) - s] + 4[sY(s) - 1] + 3Y(s) = 2R(s)$

$Y(s)[s^2 + 4s + 3] = \frac{2}{s} + 4 + s$

$Y(s) = \frac{s^2 + 4s + 2}{s(s^2 + 4s + 3)}$

b) $Y(s) = \frac{k_1}{s} + \frac{k_2}{s+3} + \frac{k_3}{s+1}$

$k_1 = \frac{2}{3}$

$k_2 = -1/6$

$k_3 = \frac{1}{2}$

$Y(s) = \frac{2/3}{s} - \frac{1/6}{s+3} + \frac{1/2}{s+1}$

$y(t) = \left(\frac{2}{3} - \frac{1}{6}e^{-3t} + \frac{1}{2}e^{-t}\right)$

c) $\lim_{t \to \infty} y(t) = 2/3$

d) $\lim_{s \to 0} sF(s) = 2/3$