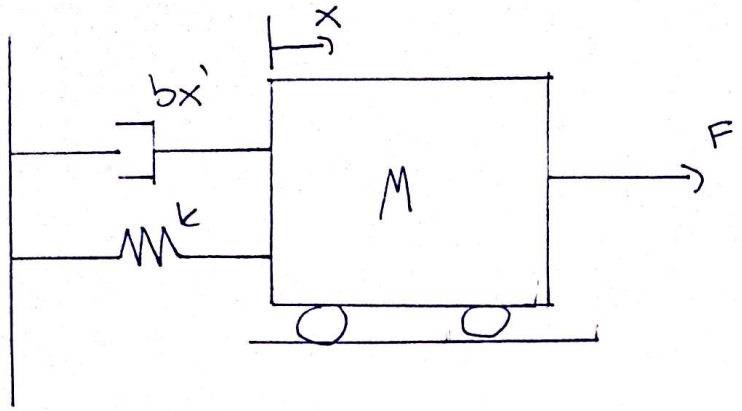
5.) Str. 33



$M = 2kg$

$k = 4\ N/m$

$b = 6\ Ns/m$

$f(t) = 0$

$x(0) = 1$

$x'(0) = 0$

a)

$-Mx'' - bx' - kx + F = 0$

$-Mx'' - bx' - kx = -F$

$Mx'' + bx' + kx = F$

$2x'' + 6x' + 4x = 0 \quad / :2$

$x'' + 3x' + 2x = 0 \rightarrow x'' = -3x' - 2x$

$s^2X(s) - sx(0) - x'(0) + 3sX(s) - 3x(0) + 2X(s) = 0$

$s^2X(s) - s + 3sX(s) - 3 + 2X(s) = 0$

$s^2X(s) + 3sX(s) + 2X(s) = s + 3$

$X(s) \cdot (s^2 + 3s + 2) = s + 3$

$$X(s) = \frac{s+3}{s^2+3s+2} = \frac{s+3}{(s+1)(s+2)}$$

$$\frac{s+3}{(s+1)(s+2)} = \frac{A}{s+1} + \frac{B}{s+2} \quad / \ (s+1)(s+2)$$

$s + 3 = A(s+2) + B(s+1)$

$s + 3 = As + 2A + Bs + B$

$s + 3 = s(A+B) + 2A + B$

$A + B = 1$ $\qquad$ $2A + B = 3$

$A = 1 - B$

$\boxed{A = 2}$ $\qquad$ $\boxed{B = -1}$

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

$$\boxed{x(t) = 2e^{-t} - e^{-2t}}$$