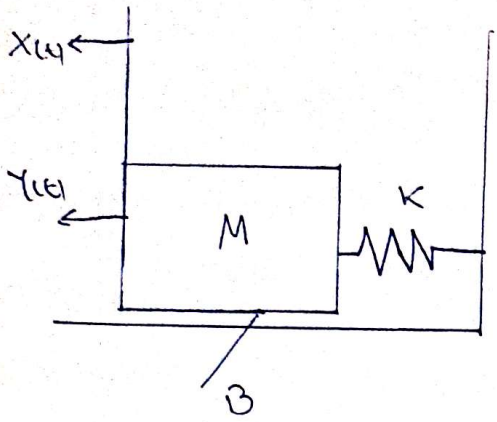
(1.) Str. 20



$M = 25\,[kg]$

$B = 75\,[Nsm^{-1}]$

$K = 50\,[Nm^{-1}]$

$F_0 = 12.5\,[N]$

$\omega = 4\,[s^{-1}]$

$Y(t) = F_0 \sin \omega t$, $x(0) = 0$, $x'(0) = 2\,[ms^{-1}]$

$$-Mx'' - Bx' - kx + y(t) = 0$$

$$-Mx'' - Bx' - kx = -y(t)$$

$$Mx'' + Bx' + kx = y(t)$$

$$Mx'' + Bx' + kx = F_0 \sin \omega t \quad / : M$$

$$x'' + \frac{B}{M}x' + \frac{k}{M}x = \frac{F_0}{M}\sin \omega t$$

$$x'' + 3x' + 2x = 0{,}5 \sin 4t$$

$$s^2X(s) - sx(0) - x'(0) + 3sX(s) - x(0) + 2X(s) = 0{,}5\,\frac{4}{s^2+16}$$

$$s^2X(s) - 2 + 3sX(s) + 2X(s) = \frac{2}{s^2+16}$$

$$s^2X(s) + 3sX(s) + 2X(s) = \frac{2}{s^2+16} + 2$$

$$X(s)\left(s^2+3s+2\right) = \frac{2+2s^2+32}{s^2+16}$$

$$X(s) = \frac{2s^2+34}{(s^2+16)(s^2+3s+2)} = \frac{2s^2+34}{(s^2+16)(s+1)(s+2)}$$

$$b_{1,2} = \frac{-3 \pm \sqrt{9-8}}{2}$$

$$b_{1,2} = \frac{-3 \pm 1}{2}$$

$b_1 = -1 \quad b_2 = -2$

$$\frac{2s+34}{(s^2+16)(s+1)(s+2)} = \frac{As+B}{s^2+16} + \frac{C}{s+1} + \frac{D}{s+2} \quad / \cdot (s^2+16)(s+1)(s+2)$$

$$2s^2+34 = (As+B)(s^2+3s+2) + C(s^3+2s^2+16s+32) + D(s^3+s^2+16s+16)$$

$$2s^2+34 = As^3+3As^2+2As+Bs^2+3Bs+2B+Cs^3+2Cs^2+16Cs+32C+Ds^3+Ds^2+16Ds+16D$$

$$2s^2+34 = s^3(A+C+D)+s^2(3A+B+2C+D)+s(2A+3B+16C+16D)+2B+32C+16D$$

$A+C+D=0$

$A=-C-D$

$A=-\frac{36}{17}+\frac{21}{10}$

$A=-\frac{3}{170}$

$3A+B+2C+D=2$

$-3C-3D+17-16C-8D+2C+D=2$

$-17C-10D=-15$

$17C=15-10D$

$C=\frac{15-10D}{17}=\frac{15+21}{17}$

$C=\frac{36}{17}$

$2A+3B+16C+16D=0$

$2B+32C+16D=34$

$2B=34-32C-16D$

$B=17-16C-8D$

$B=17-\frac{576}{17}-\frac{168}{10}$

$B=-\frac{14}{170}$

$-2C-2D+51-48C-24D+16C+16D=0$

$-34C-10D=-51$

$34C+10D=51$

$30-20D+10D=51$

$-10D=21$

$D=\frac{21}{10}$

$$\frac{2s^2+34}{(s^2+16)(s+1)(s+2)} = \frac{-\frac{3}{170}s-\frac{14}{170}}{s^2+16} + \frac{36}{17}\frac{1}{s+1} - \frac{21}{10}\frac{1}{s+2}$$

$$y(t) = -\frac{3}{170}\cos 4t - \frac{7}{340}\sin 4t + \frac{36}{17}e^{-t} - \frac{21}{10}e^{-2t}$$