

27722 ע"א / 101111 / 10100

$$\frac{C}{R} = \frac{G}{1+GH} = \frac{\frac{K(s+10)}{s(s+2)(s+4)}}{1 + \frac{K(s+10)}{s(s+2)(s+4)}} = \frac{K(s+10)}{s(s+2)(s+4) + K(s+10)} \quad (1)$$

$$\boxed{\frac{C}{R} = \frac{K(s+10)}{s^3 + 6s^2 + (8+K)s + 10K}}$$

$s^3$	1	$8+K$	0
$s^2$	6	$10K$	0
$s^1$	$\frac{6(8+K) - 10K}{6}$		
$s^0$	$10K$		

$$\frac{48+6K-10K}{6} > 0 \Rightarrow 48-4K > 0 \Rightarrow \underline{K < 12} \quad (2)$$

$$10K > 0 \Rightarrow \underline{K > 0}$$

$$\boxed{0 < K < 12} \quad \text{לפי } 27722 \text{ ו- } 101111$$

$K_a = 0$   $\Rightarrow$  אין ערך סף, 1 עלון פ"א (3)

$$\text{לפי } 101111 \quad e_{ss} = \frac{1}{K_a} = \infty$$

$$\frac{e}{R} = \frac{G}{1+G} \Rightarrow G = \frac{e/R}{1 - e/R} \quad (1)$$

$$\left. \begin{aligned} C(s) &= \frac{1}{s(s+3)} \\ R(s) &= \frac{1}{s} \end{aligned} \right\} \frac{e}{R} = \frac{1}{s+3}$$

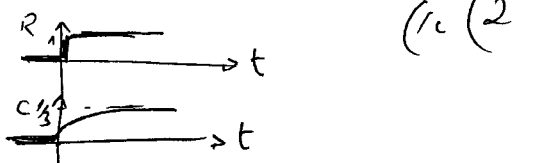
$$G = \frac{\frac{1}{s+3}}{1 - \frac{1}{s+3}} = \frac{1}{(s+3) - 1} = \frac{1}{s+2}$$

$$K_p = \lim_{s \rightarrow 0} GH = \frac{1}{s+2} = \frac{1}{2}$$

$$e_{ss} = \frac{1}{1+K_p} = \frac{1}{1+\frac{1}{2}} = \frac{2}{3}$$

$$C(\infty) = \frac{1}{3}(1 - e^{-3t}) = \frac{1}{3}(1 - 0) = \frac{1}{3} \quad (2)$$

$$R=1 \Rightarrow e_{ss} = 1 - \frac{1}{3} = \frac{2}{3}$$



$$e(t) = R(t) - C(t) \quad (3)$$

$$e(t) = 1 - \frac{1}{3}(1 - e^{-3t})$$

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

$$E(s) = \frac{1}{3} \left( \frac{2}{s} + \frac{1}{s+3} \right) = \frac{1}{3} \frac{3s+6}{s(s+3)}$$

$$G(s) = \frac{C(s)}{E(s)} = \frac{\frac{1}{s(s+3)}}{\frac{1}{3} \frac{3s+6}{s(s+3)}} = \frac{3}{3s+6} = \frac{1}{s+2}$$

$s^2$  פתרון של משוואה  $fe$   $\eta = 2$   $\omega_n = 2$   $\zeta = 0.3$  (ב)

$$\frac{C}{R} = \frac{\frac{\omega_n^2}{s(s+2\zeta\omega_n)}}{1 + \frac{\omega_n^2}{s(s+2\zeta\omega_n)}} = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \quad (\text{א})$$

$$t_p = 2, \quad M_p = 1.1$$

1.1

$$M_p = 1 + e^{-\frac{\zeta\pi}{\sqrt{1-\zeta^2}}}$$

$$1.1 = 1 + e^{-\frac{\zeta\pi}{\sqrt{1-\zeta^2}}} \Rightarrow \ln 0.1 = -\frac{\zeta\pi}{\sqrt{1-\zeta^2}}$$

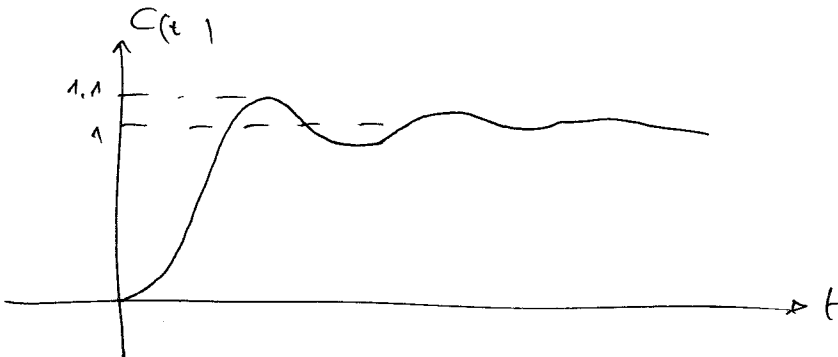
$$2.3\sqrt{1-\zeta^2} = \zeta\pi \quad / \text{ סדרנו, נרדף}$$

$$5.3(1-\zeta^2) = \zeta^2\pi^2$$

$$\zeta = \sqrt{\frac{5.3}{5.3 + \pi^2}} = 0.6$$

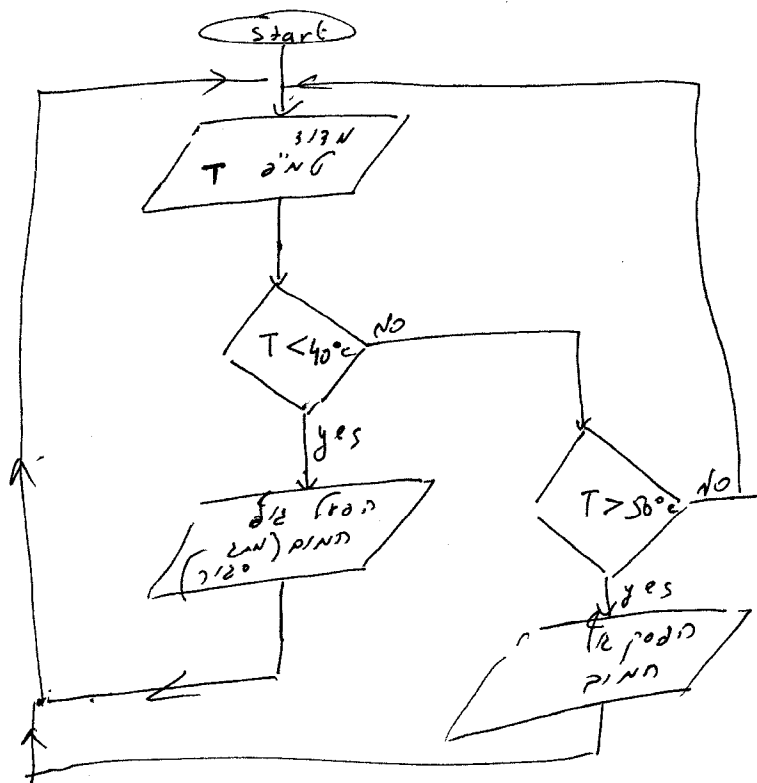
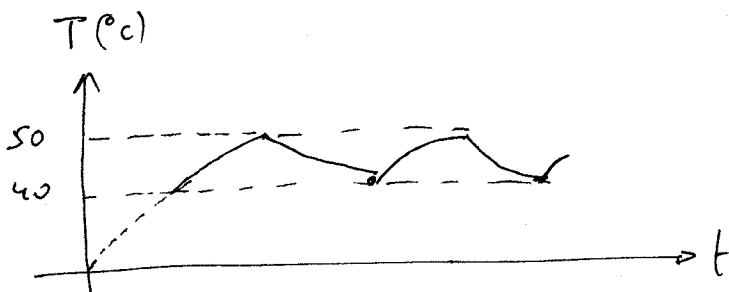
$$t_p = \frac{\pi}{\omega_n \sqrt{1-\zeta^2}} = 2$$

$$\underline{\underline{\omega_n = \frac{\pi}{2\sqrt{1-0.6^2}} = 1.96 \frac{\text{rad}}{\text{s}}}}$$



4) (א) הפק'ת 3 א/ד למחרת את המידע הנתון באמצעות אמצעי 8 ביט.  
 רצוי רצוי הפק'ת א' 8 המס'.

$$\Delta = \frac{V_{max}}{2^n - 1} = \frac{5}{2^8 - 1} = \frac{5}{255} = 19.6 \text{ mV}$$



100°C → 5V → Data = 1111 1111

40°C →  $5 \cdot \frac{40}{100} = 2V$  → Data =  $\frac{2}{\Delta} = 102$

Data = 01100110

60°C →  $V = 5 \cdot \frac{60}{100} = 3V$  → Data =  $\frac{3}{\Delta} = 153$

Data = 10011001