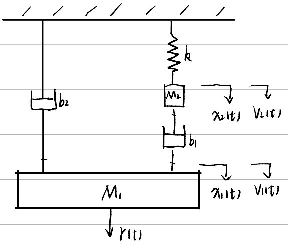
日期:　　/

2.3 解:



对M1、M2列写微分方程

$$\begin{cases} r(t) = b_1 \cdot \dfrac{d(x_2-x_1)}{dt} + b_2 \cdot \dfrac{d(x_2-x_1)}{dt} + M_1 \cdot \dfrac{d^2x_1}{dt^2} \\ b_2 \cdot \dfrac{d(x_2-x_1)}{dt} = k x_2 + M_2 \cdot \dfrac{d^2x_2}{dt^2} \end{cases}$$

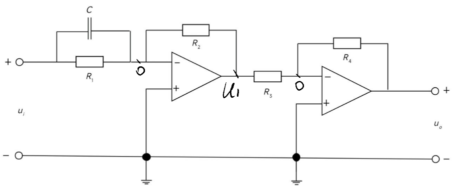
作拉氏变换为
$$\begin{cases} R(s) = b_1 s\left(X_2(s)-X_1(s)\right) + b_2 s\left(X_2(s)-X_1(s)\right) + M_1 s^2 X_1(s) \\ b_2 s\left(X_2(s)-X_1(s)\right) = k X_2(s) + M_2 s^2 \cdot X_2(s) \end{cases}$$

代入消去$X_2(s)$ 得 $X_2(s) = \dfrac{b_2 s}{b_2 s - k - M_2 s^2} X_1(s)$

代入原方程得 $M_1 s^2 X_1(s) + (b_1+b_2) s \dfrac{k+M_2 s^2}{b_2 s - k - M_2 s^2} X_1(s) = R(s)$

$\therefore$ 传递函数 $H(s) = \dfrac{1}{M_1 s^2 + (b_1+b_2)\, s\, \dfrac{k+M_2 s^2}{b_2 s - k - M_2 s^2}} = \dfrac{b_2 s - k - M_2 s^2}{M_1 s^2(b_2 s - k - M_2 s^2) + (b_1+b_2) s (k+M_2 s^2)}$

2.7 解:



设如图所示的结点电压为U_1
其拉氏变换为$U_1(s)$

由于理想运放满足虚短虚断, 列写KCL为:

$\dfrac{U_i - 0}{R_1 // \frac{1}{sC}} = \dfrac{0 - U_1}{R_2}$　　$\dfrac{U_1 - 0}{R_3} = \dfrac{0 - U_o}{R_4}$　　R_1

即有: $\dfrac{U_i(R_1 sC+1)}{R_1} = -\dfrac{U_1}{R_2}$　　$\dfrac{U_1}{R_3} = \dfrac{-U_o}{R_4}$　　代换, 消去U_1有

$\therefore H(s) = \dfrac{U_o}{U_i} = \dfrac{(R_1 Cs+1) R_2 R_4}{R_1 R_3}$

微分方程为 $R_1 R_2 R_4 C \cdot \dfrac{du_i}{dt} + R_2 R_4 \cdot u_i = R_1 R_3 \cdot u_o$

日期:　　　/