六、计算

https://www.bilibili.com/video/BV1hr4y1U7T2/?spm_id_from=333.880.my_history.page.click&vd_source=92c5d39528a7755e8330e9b224eab754

1. L

$$V_B k = V_2$$

$$V_B = \frac{\frac{1}{sC_2}}{\frac{1}{sC_2} + R_2} V_A \qquad [V_1 - V_A]\frac{1}{R_1} = V_A[\frac{1}{R_2 + \frac{1}{sC_2}}] + [V_A - V_2]sC_1$$

$$H(s) = \frac{V_2(s)}{V_1(s)} = \frac{k}{R_1 R_2 C_1 C_2 s^2 + (R_1 C_1 + R_1 C_2 + R_2 C_2 - kR_1 C_1)s + 1}$$

2. 二阶罗斯准则

$$R_1 C_1 + R_1 C_2 + R_2 C_2 - kR_1 C_1 > 0$$

3. 临界稳定

$$R_1 C_1 + R_1 C_2 + R_2 C_2 - kR_1 C_1 = 0$$

$$H(s) = \frac{V_2(s)}{V_1(s)} = \frac{k}{R_1 R_2 C_1 C_2 s^2 + 1}$$

$$h(t) = \frac{k}{\sqrt{R_1 R_2 C_1 C_2}} \sin \frac{1}{\sqrt{R_1 R_2 C_1 C_2}} t u(t)$$

4.

$$H(s) = \frac{1}{(s+1)^2} \qquad H(jw) = \frac{1}{(jw+1)^2}$$

$$|H(jw)| = \frac{1}{(\sqrt{w^2+1})^2} = \frac{1}{w^2+1}$$

低通滤波器

3db 贷带宽，幅度 $\frac{\sqrt{2}}{2}$ 的位置 $\qquad |H(jw)| = \frac{1}{(\sqrt{w^2+1})^2} = \frac{1}{w^2+1} = \frac{\sqrt{2}}{2}$

$$w_c = \pm\sqrt{\sqrt{2}-1}$$

5. 运算放大器开环，$C_1 = 0$

$$H(s) = \frac{1}{2s+1} \qquad H(jw) = \frac{1}{2jw+1} \qquad |H(jw)| = \frac{1}{\sqrt{4w^2+1}} = \frac{\sqrt{2}}{2} \qquad w_c = \pm\frac{1}{2}$$