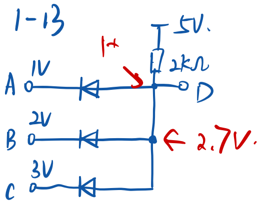
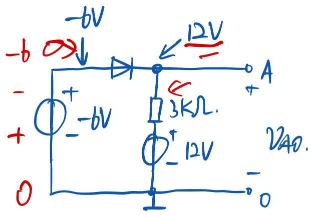
1-13



假设法：若C导通，且B一定导通，B导通A一定导通。
故 $V_D = 1+0.7 = 1.7V$.

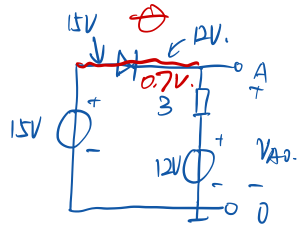
1-15.

判断二极管是否导通：假设法 !!!



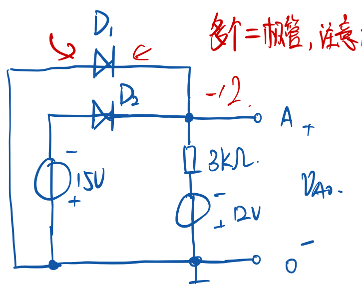
如果不导通，反偏，假设不成立

∴ $V_{AO} = 12V$.

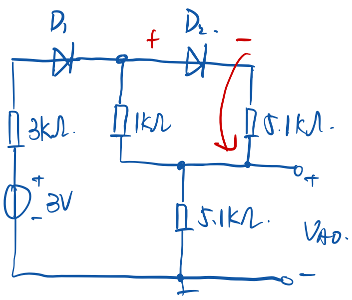


如果不导通，
左15V，右12V，假设不成立。
∴导通。
$V_{AO} = 15V - 0.7V$

多个二极管，注意相互影响。

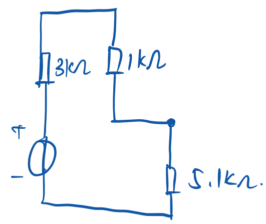


如果都不导通
$V_{D_1左}=0V$， $V_{D_1右}=-12V$.
$V_{D_2左}=-15V$， $V_{D_2右}=-12V$.
∴ D_1、D_2导通
↓
D_1导通的情况下，$V_{D_2左}=-15V$，$V_{D_2右}=0V$，D_2截止.
∴ D_1导通，D_2不导通，$V_{AO}=0V$.

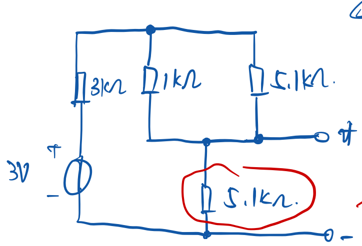


如果D_1,D_2都不导通
$V_{D_1左}=3V$，$V_{D_1右}=0V$.
D_1必然导通

假设D_2导通 →



1kΩ电阻上必然有压降，不合理。
∴ D_2导通.



$$V_{AO} = 3\cdot\frac{5.1}{3+1\|5.1+5.1} \approx 2.2V.$$

1-16.

Taylor Series: $f(x) = f(x_0) + \frac{1}{1!}f'(x_0)(x-x_0) + \frac{1}{2!}f''(x_0)(x-x_0)^2+\cdots$

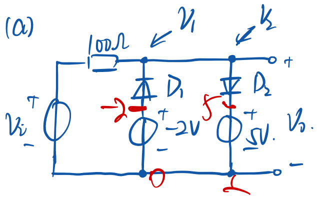
$$I = I_s e^{(\frac{V}{V_T}-1)} = \frac{I_s}{e} e^{\frac{V}{V_T}} = \frac{I_s}{e}\left(e^{\frac{V_Q}{V_T}} + \underbrace{\frac{1}{V_T}e^{\frac{V_Q}{V_T}}\Delta V}_{①} + \underbrace{\frac{1}{V_T^2}e^{\frac{V_Q}{V_T}}\cdot\frac{1}{2}\Delta V^2}_{②}+\cdots\right).$$

$$\frac{e^{\frac{V_Q}{V_T}}}{2V_T^2}\Delta V^2 \le \frac{1}{10}\cdot\frac{e^{\frac{V_Q}{V_T}}}{V_T}\Delta V.$$

$$\Delta V \le \frac{1}{5}V_T = 5.2mV.$$

1-18

(a)

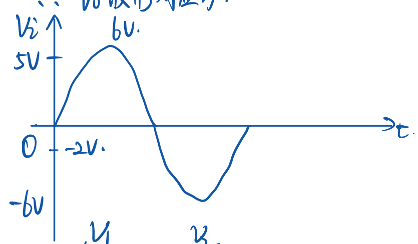


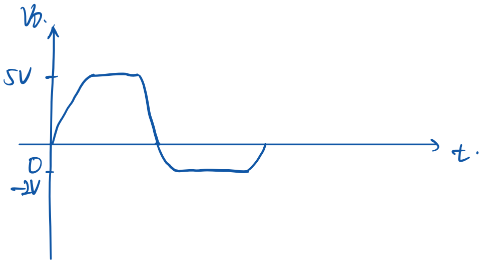
D_1导通条件: $V_1 < -2V$.

D_2导通条件: $V_2 > 5V$.

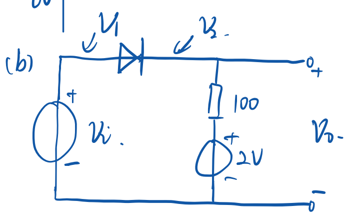
整流

∴ V_o波形对应为.





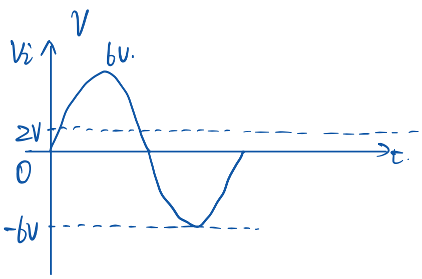
(b)

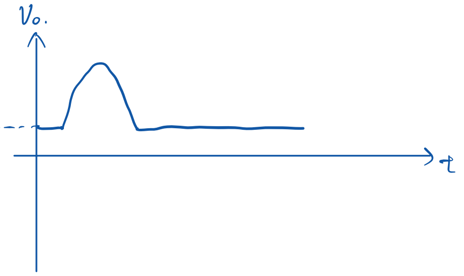


当D_1不导通时,

$V_1 = V_i$, $V_2 = 2V$.

当 $V_1 > V_2 = 2V$时,导通. $V_o = V_i$.

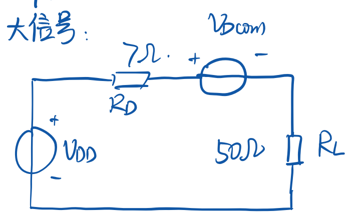




半波整流.

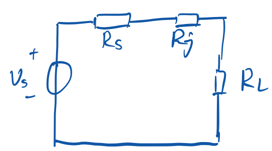
1-19.

大信号:



$$I_D = \frac{V_{DD} - V_{D(on)}}{R_D + R_L} = \frac{0.75}{57} \approx 13.16\,mA.$$

小信号:



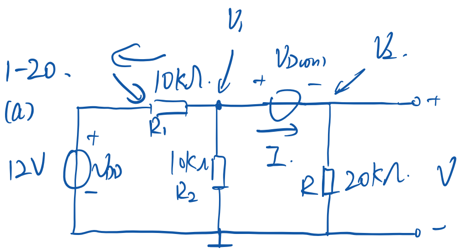
$$R_j = \frac{V_T}{I_s} = \frac{26mV}{13.16mA} \approx 2\Omega.$$

$$i_d = \frac{V_s}{R_s+R_j+R_L} = \frac{20}{54} \approx 0.37mA.$$

$$\therefore i_D = I_D + i_d = 13.16 + 0.37\sin\omega t\ (mA).$$

1-20.

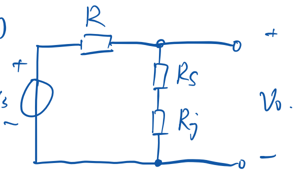
(a)



$$\begin{cases} \frac{V_1 - V_{DD}}{R_1} + \frac{V_1}{R_2} + I = 0. \\ V_1 - V_2 = V_{D(on)}. \\ \boxed{I = \frac{V_2}{R}.} \end{cases} \Rightarrow \begin{cases} V_1 = 4.94V \\ V_2 = 4.24V. \\ I = 212\,\mu A \end{cases}$$

节点电压法.

(b)



(1) $I_D = 1\,mA$. $R_j = 26\,\Omega$.

$V_o = V_s \dfrac{R_s + R_j}{R_s + R_j + R} \approx 3.83 \sin\omega t \; mV$.

(2) $I_D = 0.1\,mA$. $R_j = 260\,\Omega$.

$V_o = 8.41 \sin\omega t \; mV$.

2-5

$I_C = \bar{\alpha} I_E + I_{CBO}$.

$I_C = \bar{\beta} I_B + I_{CEO}$.

$I_C = I_S e^{\frac{U_{BE}}{U_T}}$.