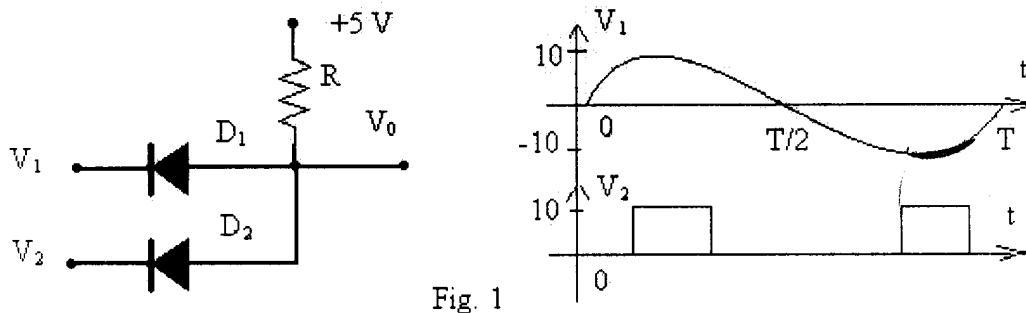


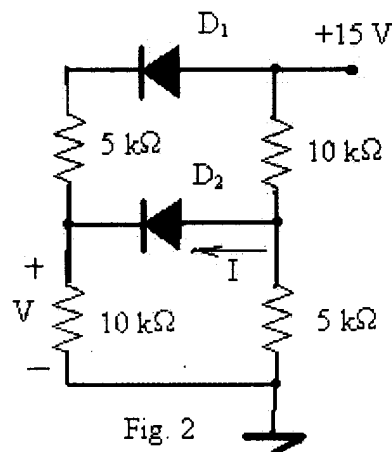
Student Name _____

Faculty No: _____

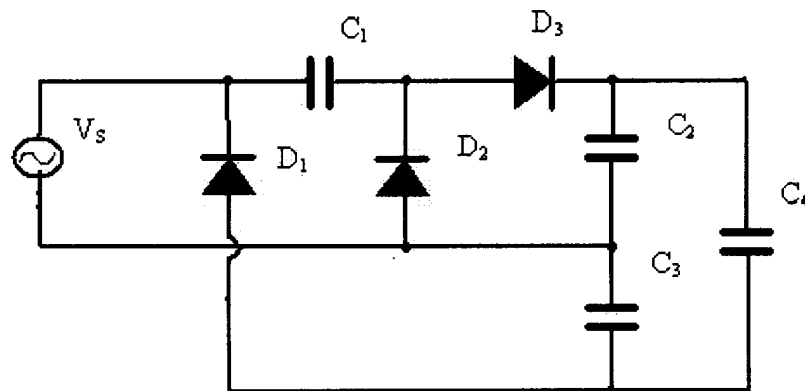
1. Signals applied to the circuit of Fig. 1 are shown. Define and plot the output signal V_o , assuming ideal diodes.



2. Find the values of I and V for the circuit of Fig.2 assuming that the diodes are ideal.



3. The circuit shown in Fig.3 has a **20 V** peak sinusoidal input signal. Determine V_{C1} , V_{C2} , V_{C3} and V_{C4} for the circuit. Assume that the diodes are ideal.



4. Determine the range of V_i that will maintain the Zener diode of Fig. 4 in the "ON" state. ($V_Z = 10\text{ V}$, $I_{ZM} = 20\text{ mA}$).

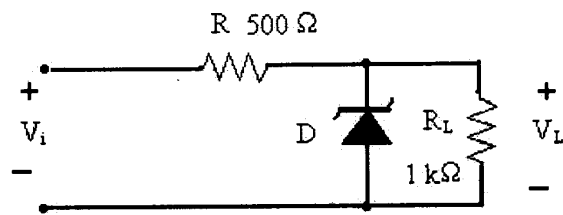
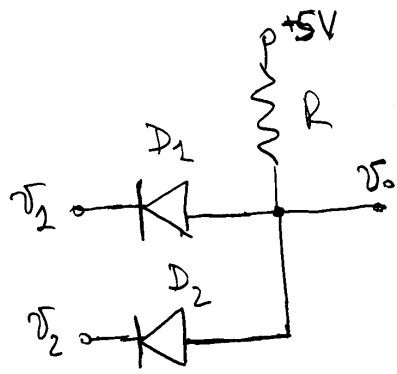


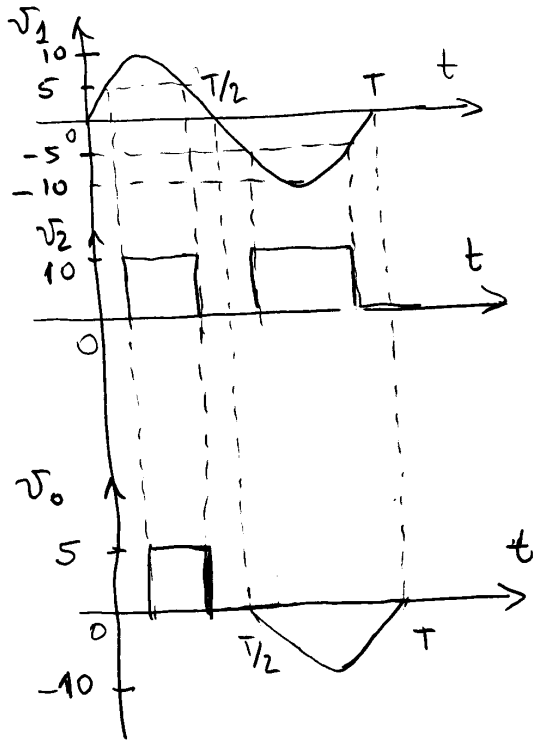
Fig.4

5. Calculate the voltage gain ($A_v = V_o/V_i$) for the common base network, if ac input resistance $R_i = 50\ \Omega$, ac output resistance $R_o = 500\text{ k}\Omega$ and load resistance $R_L = 2\text{ k}\Omega$. Assume, that $\alpha = 1$.

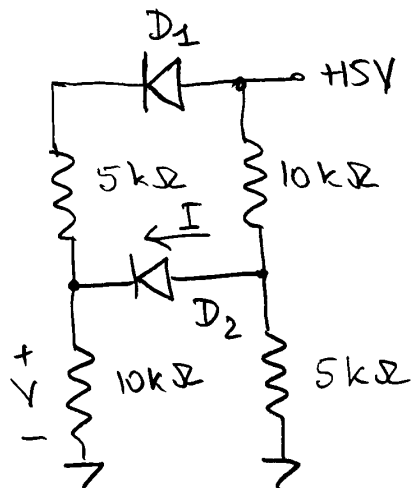
20 points (each 4 points).
Good Luck!



1 Signals applied to the circuit of Fig. 1 are shown. Define and plot the output signal, assuming ideal diodes.



Solution:



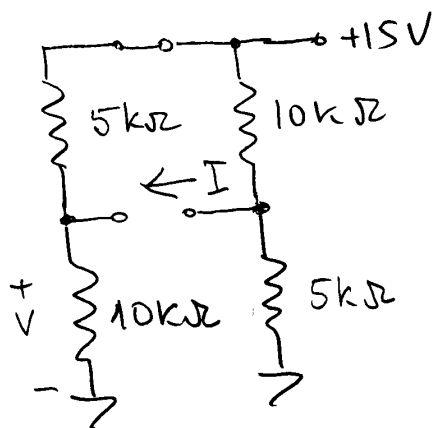
2. Find the values of I and V for the circuit of Fig. 2 assuming that the diodes are ideal.

Solution

Voltage source of $+15V$ opens D_1 and due to the current in voltage divider stabilize $V = +10V$.

From the other side there is voltage $5V$ across resistor of $5k\Omega$. The D_2 is in "OFF" state, then

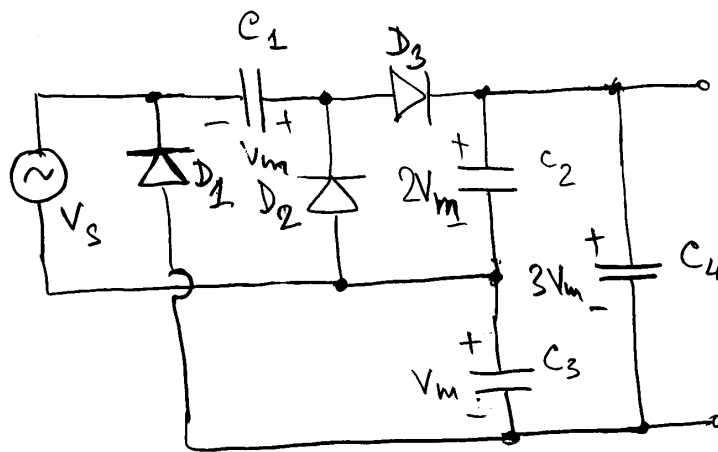
equivalent circuit is of form shown, and current $I = 0mA$



Answers:

$$V = 10V$$

$$I = 0A$$

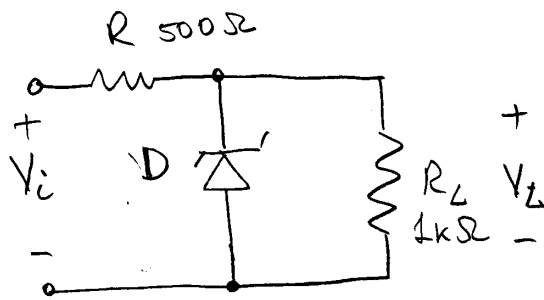


3. The circuit shown in Fig. 3 has a 20 V peak input signal. Determine V_{C1} , V_{C2} , V_{C3} and V_{C4}

for the circuit. Assume that the diodes are ideal.

Solution

- When acts negative half-wave of the input signal, capacitors C_1 and C_3 charges up to $V_m = 20\text{ V}$ through D_2 and D_4 respectively with polarity shown.
- When acts positive half-wave of the input signal, C_2 charges through D_3 up to $2V_m = 40\text{ V}$.
- Because C_2 and C_3 are in series and this branch is in parallel to C_4 , total output voltage is $V_m + 2V_m = 3V_m = 3 \cdot 20 = 60\text{ V}$



4. Determine the range of V_i that will maintain the Zener diode of Fig. 4. in the "ON" state.
 ($V_Z = 10\text{ V}$, $I_{Zm} = 20\text{ mA}$)

Solution

$$V_{i\min} = \frac{R_L + R}{R_L} V_Z = \frac{(1 + 0.5) \cdot 10^3}{1 \cdot 10^3} \cdot 10 = 15\text{ V}$$

$$I_L = \frac{V_L}{R_L} = \frac{V_Z}{R_L} = \frac{10}{1 \cdot 10^3} = 10\text{ mA}$$

$$I_{R\max} = I_{Zm} + I_L = 20 + 10 = 30\text{ mA}$$

$$\begin{aligned} V_{i\max} &= I_{R\max} \cdot R + V_Z = 30 \cdot 0.5 \cdot 10^{-3} \cdot 10^3 + 10 = \\ &= 15 + 10 = 25\text{ V} \end{aligned}$$

5. Calculate the voltage gain ($A_v = V_o/V_i$) for the common base network, if $R_i = 50\Omega$, $R_o = 500k\Omega$ and $R_L = 2k\Omega$. Assume that $\alpha = 1$.

Solution

1. Input current is

$$I_i = \frac{V_i}{R_i} = \frac{V_i}{50} \text{ A}$$

2. Assuming $\alpha = 1$, then $I_{out} = I_{input}$ and

$$\begin{aligned} V_o &= I_o \cdot R_L = I_i R_o = \frac{V_i}{50} 2 \cdot 10^3 \\ &= 40 V_i \text{ V} \end{aligned}$$

3. Voltage gain is

$$A_v = \frac{V_o}{V_i} = \frac{40 V_i}{V_i} = 40$$