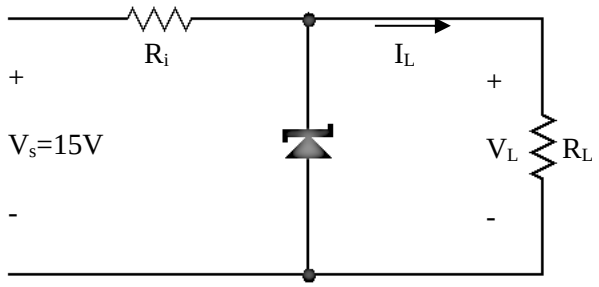
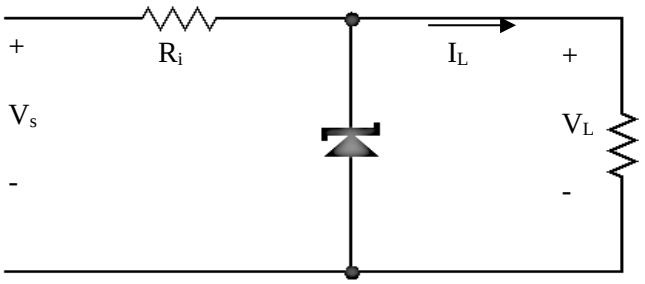
Questions

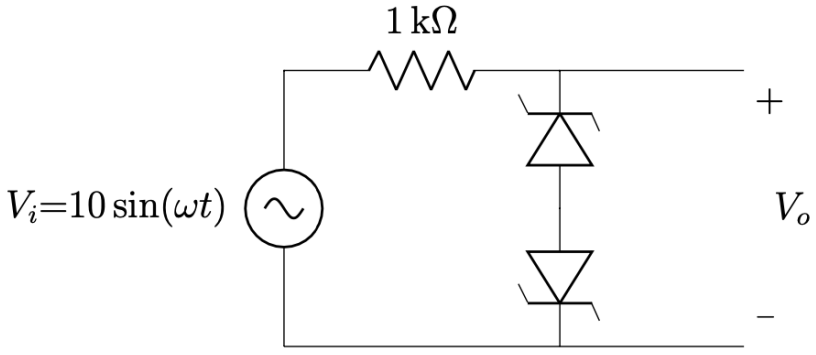
1. The Zener diode in the following circuit has V_z = 12V, minimum current I_{zmin} = 2mA, and maximum power P_{zmax} = 0.6W. Determine the smallest possible R_i such that the voltage across the load is maintained at 12V. With this value of R_i if the diode is operating in the Zener mode, what is the minimum possible value of R_L? Unless specified otherwise, assume constant voltage drop model for the diode operating in the Zener region.



2. In the following circuit, V_L = 12V, V_s = 20V, and I_L varies from 0 to 100mA. If the diode is operating in the Zener mode, determine the value of R_i such that P_{zmax} of the diode is as small as possible. Determine P_{zmax} for the calculated value of R_i.

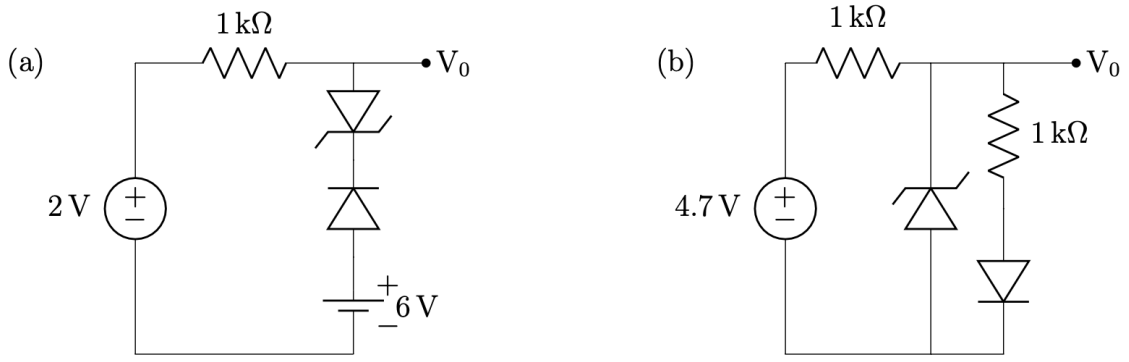


3. The Zener diodes used in the circuit below have the following characteristics: Forward drop = 0.7 V; Zener voltage = - 7 V; Rf (Forward Resistance) = 20 Ω ; Rz (Resistance in Zener region) = 10 Ω. Sketch the output waveform Vo with time.

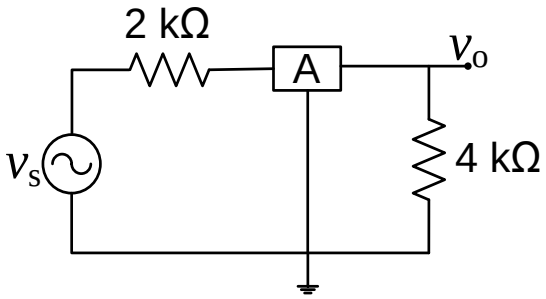


4. Determine the output voltage with reference to ground for the circuits shown below assuming

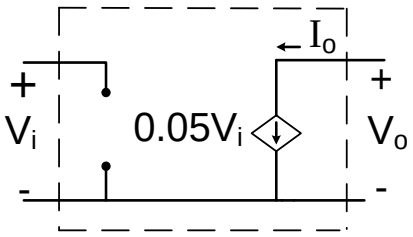
that cut-in voltage of both diode and zener diode is 0.7V and that Zener voltage is 3V.



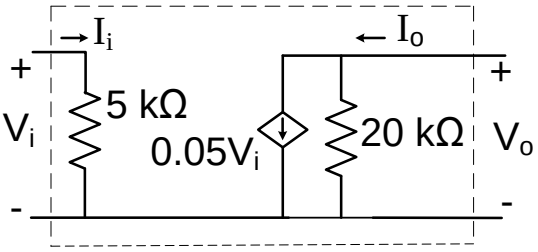
5. Determine the ac voltage gain of the amplifier 'A' as shown in (a) using the two transistor models shown in (b) and (c) as dotted region. Assume that the device 'A' is biased properly.



(a)

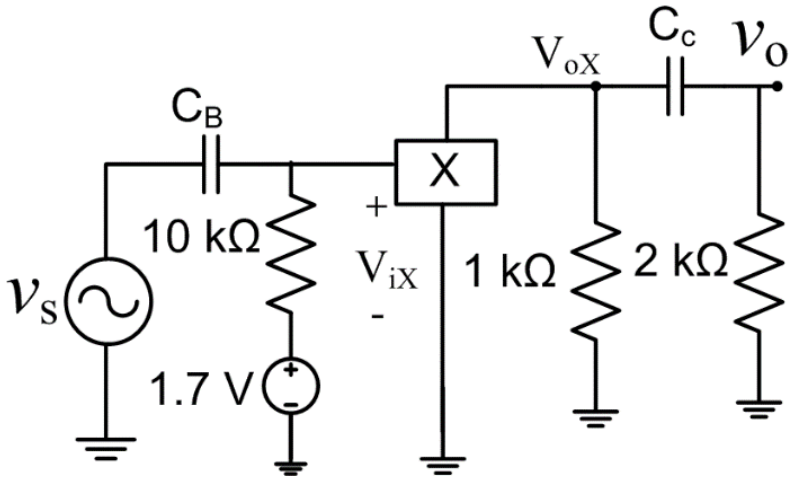


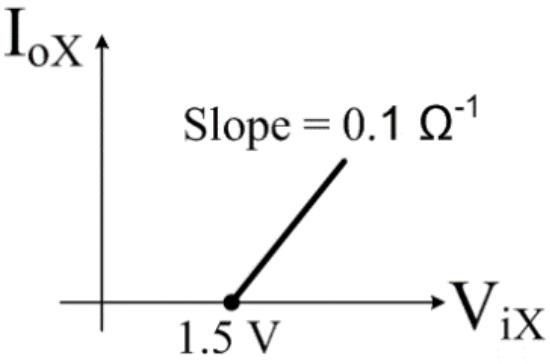
(b)

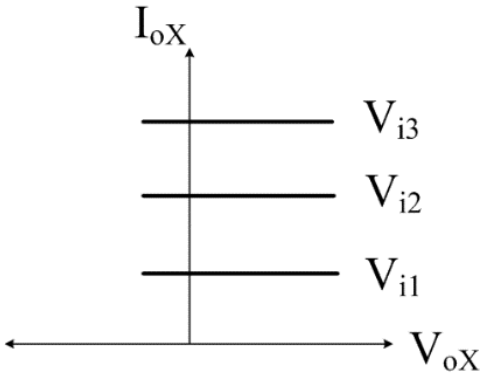


(c)

6. Carry out DC and AC analysis of the amplifier circuit, with amplifier '**X**', whose device characteristics are shown below. Also, sketch V_{iX}, V_{oX} and v_0 for $v_S = 0.2\sin(\omega t)$.


C_B
C_c
v_o
V_{oX}
X
+
V_{iX}
-
10 kΩ
1 kΩ
2 kΩ
v_s
1.7 V


I_{oX}
Slope = 0.1 Ω^{-1}
1.5 V
V_{iX}


I_{oX}
V_{i3}
V_{i2}
V_{i1}
V_{oX}