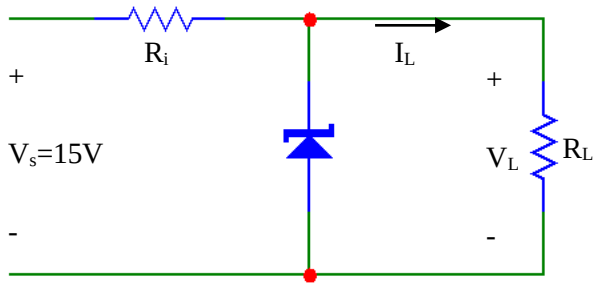
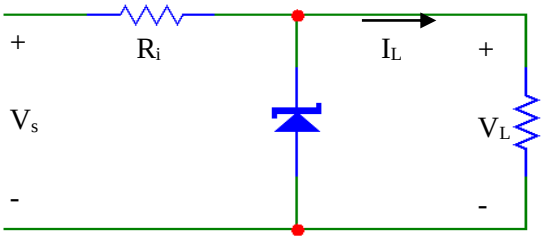
**Assignment-6**

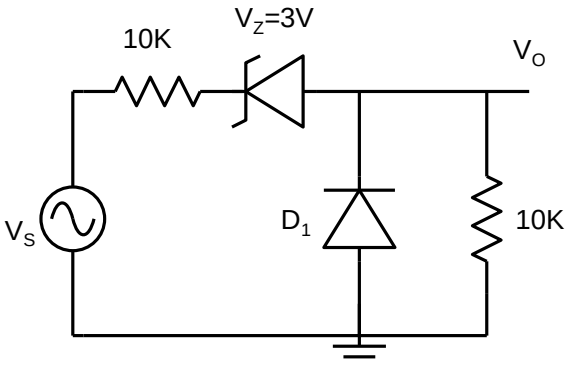
1. The Zener diode in the following circuit has $V_z$=12V, $I_{zmin}$=2mA, and $P_{zmax}$=0.6W. Determine the smallest possible $R_i$ such that the voltage across the load is maintained at 12V. With this value of $R_i$ if the diode is operating in the Zener mode, what is the minimum possible value of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



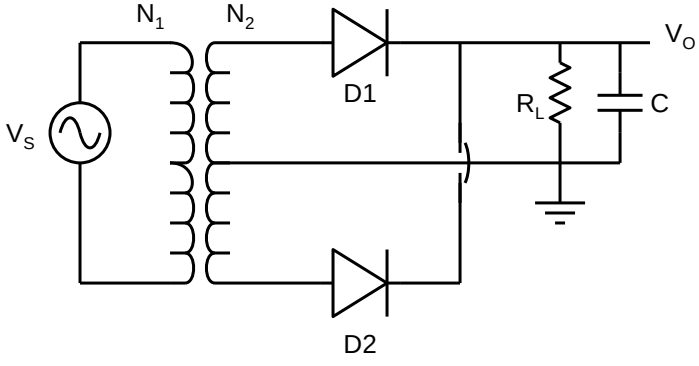

2. In the following circuit, $V_L$=12V, $V_s$=20V, and $I_L$ varies from 0 to 100mA. If the diode is operating in the Zener mode, determine the value of $R_i$ such that $P_{zmax}$ of the diode is as small as possible. Determine $P_{zmax}$ for the calculated value of $R_i$.




3. Determine the input-output characteristics of the circuit shown on the right for input voltage varying between -10 and 10 V. Assume that cut-in voltage of the diodes is zero.




4. Design the power supply circuit shown below that will supply 10V to a load of 1000Ω with ripple voltage less than 0.2V. As part of the design, determine transformer turns ratio, value of capacitance, diode peak current and peak inverse voltage. Assume that input is 220V rms with a frequency of 50Hz. Assume constant voltage-drop model (0.7 V) for diodes.



[**Note:** DC Voltage = $V_I$ (all capital letters); ac Voltage = $v_i$ (all small letters); Net voltage = $V_i$ (base is in capital and subscript is in small letter; device (A, X, Y or Z) is always in capital letter ]

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

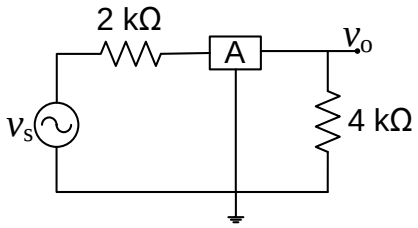



**Fig. 5(a)**

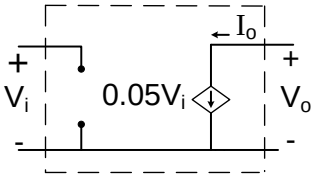



**Fig. 5(b)**

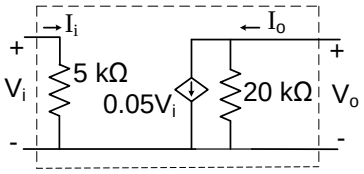



**Fig. 5(c)**

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 $v_S = 0.2\sin(\omega t)$.