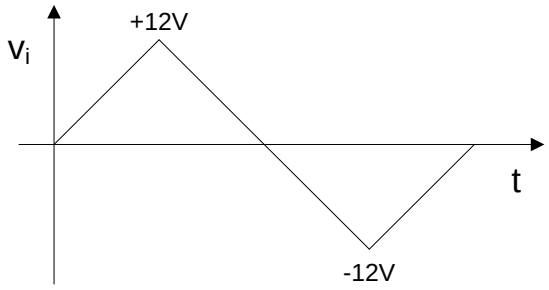
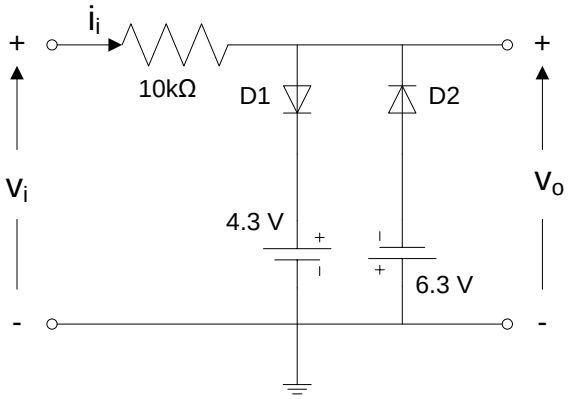
LONG ASSIGNMENT-1 (EE 101: Basic Electronics)

DEPARTMENT OF ELECTRONICS & ELECTRICAL ENGINEERING, IIT GUWAHATI

To be submitted on 12th Sept, 19 (Thursday)

Problem-1: For the circuit shown below, sketch the waveform for the output voltage v_o and the current i_i through the 10 KΩ resistor. Assume ideal diodes with a forward voltage of 0.7 V.



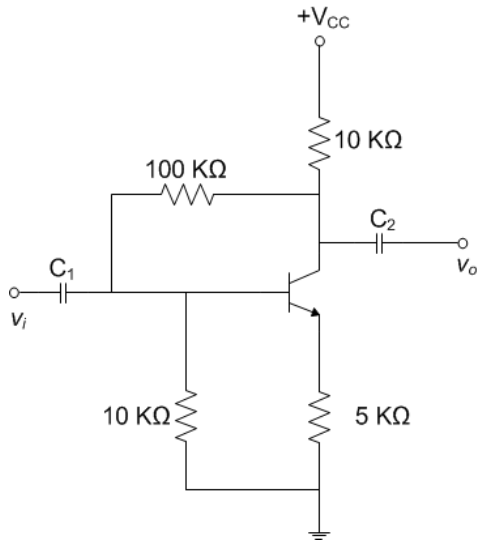


Problem-2: In the transistor amplifier shown, the transistor is biased in the active region with β=100 and r_e=100 Ω (r_o can be ignored).

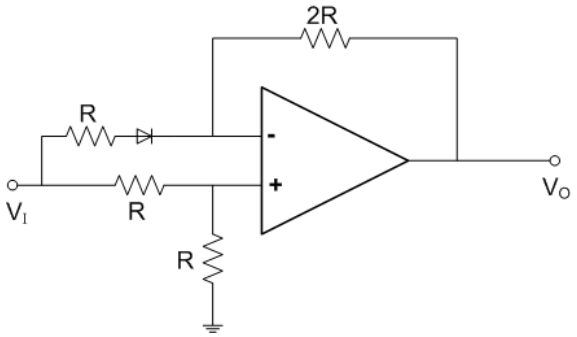
(a) Draw the small signal equivalent circuit for this amplifier

(b) Calculate the voltage gain $\frac{v_o}{v_i}$

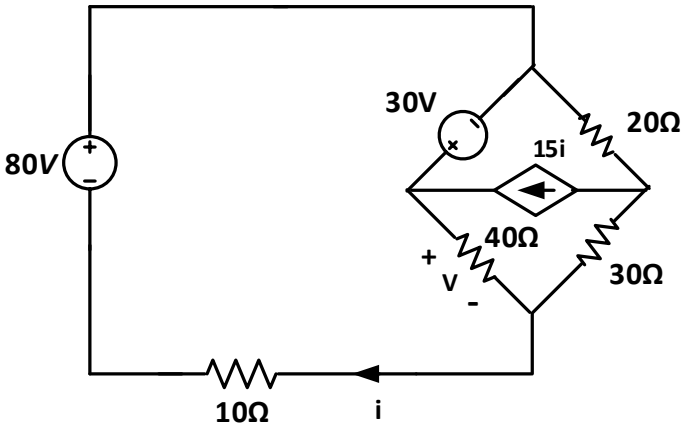
(c) Calculate the Input Impedance Z_i



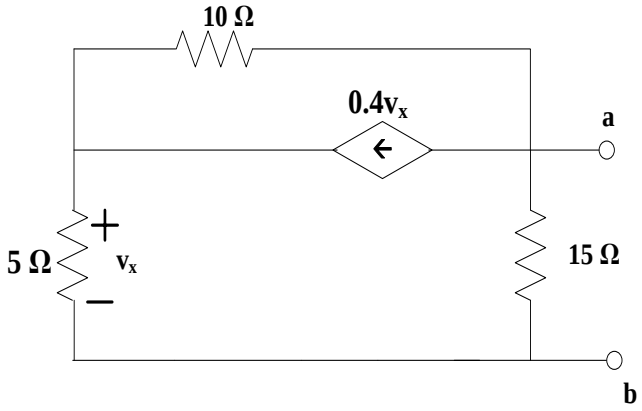
Problem-3: Derive and draw the V_O vs. V_I characteristic for the circuit shown in the figure. Consider both positive and negative values of the input voltage V_I. Assume the diode to be ideal with a forward bias voltage of 0.7 V.



Problem-4: Determine voltage across the 40 Ω resistor using the Mesh analysis. (Answers up to two decimal places)

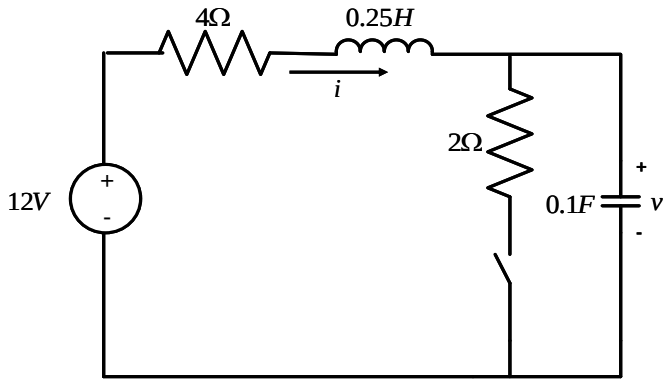


Problem-5: Find Thevenin equivalent of the following circuit across the terminal a-b.

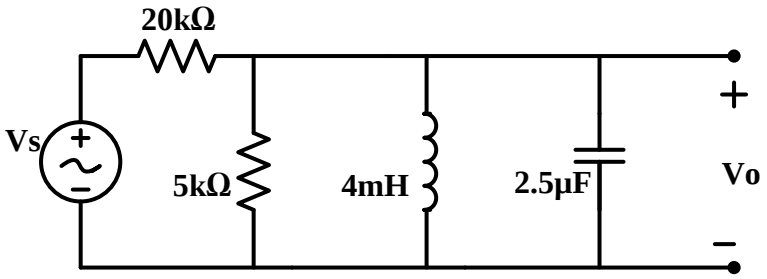


Problem-6: For the network shown below, the switch has been closed for a long time. It is opened at time t = 0. Find

a. $i(0^+)$ b. $v(0^+)$ c. $\frac{di(0^+)}{dt}$ d. $\frac{dv(0^+)}{dt}$ e. $i(\infty)$ f. $v(\infty)$



Problem-7: Determine the frequency at which the source Vs will be subjected to resistive load only. What will be the maximum source voltage at that frequency that will result in a maximum output voltage of 100 V.



Problem-8: For the network shown below, find:

a. The average power generated by the current source
b. The average power generated by the voltage source
c. The average power absorbed by the resistor
d. The average power absorbed by the inductor
e. The average power absorbed by the capacitor