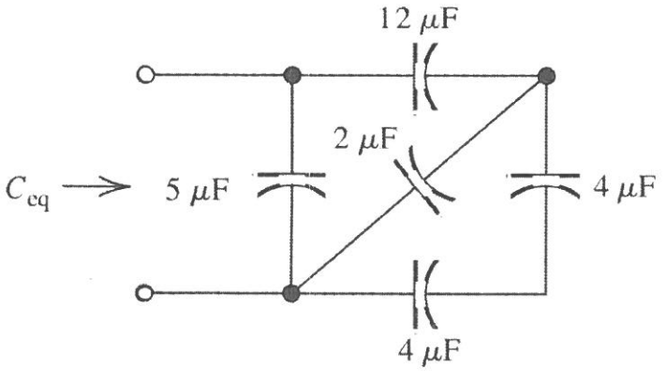
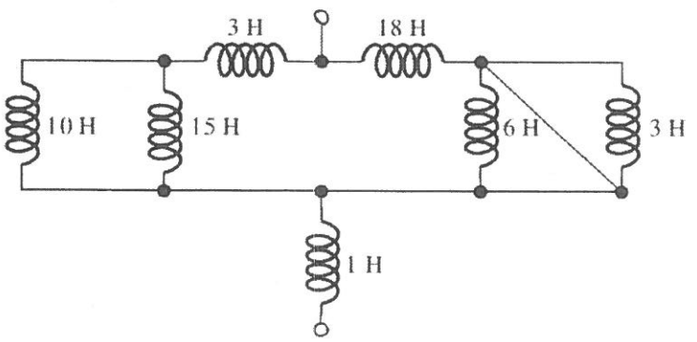
Problem 1.

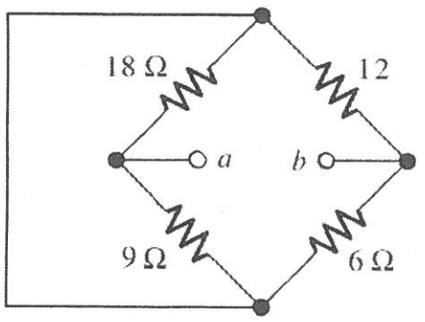
(a) (5%) Find the equivalent capacitance for the circuits shown below:



(b) (5%) Find the equivalent inductance for the circuits shown below:



(c) (5%) Find the equivalent resistance between terminal a and b



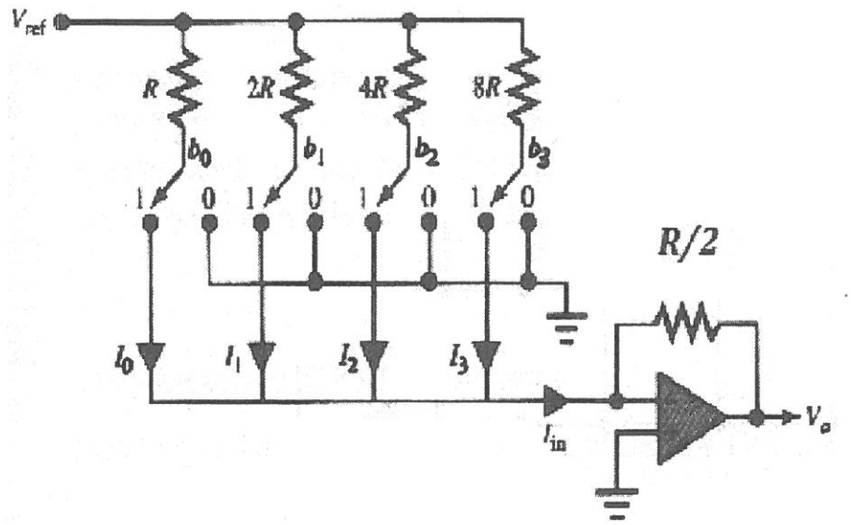
Problem 2.

Represent the output voltage V_o in terms of V_{ref} based on the following status of b_0, b_1, b_2 and b_3

(a) (5%) $[b_0, b_1, b_2, b_3]=[0\ 0\ 0\ 1]$

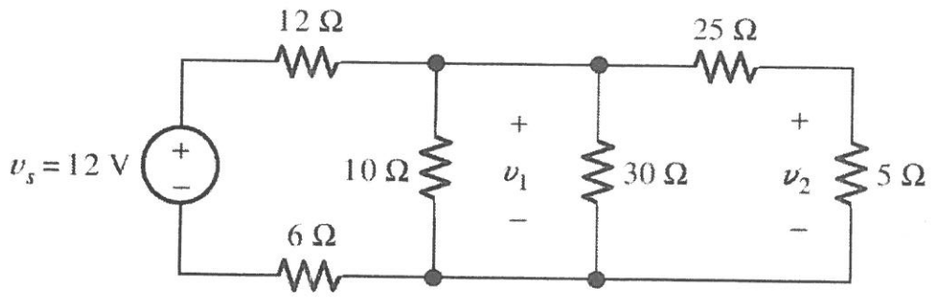
(b) (5%) $[b_0, b_1, b_2, b_3]=[0\ 1\ 1\ 1]$

(c) (5%) $[b_0, b_1, b_2, b_3]=[1\ 0\ 0\ 0]$

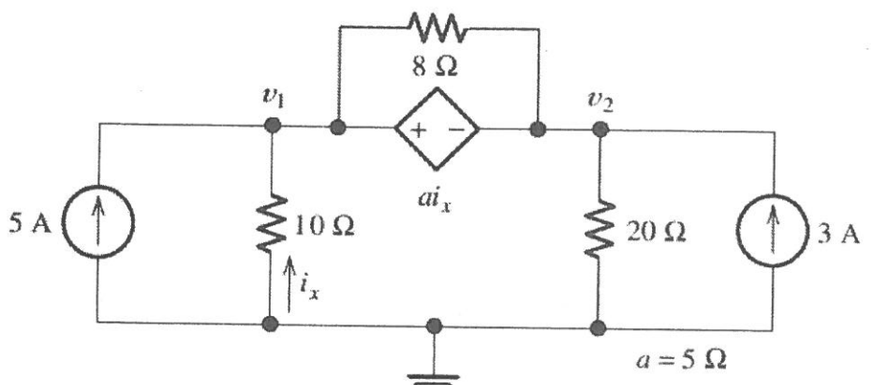


Problem 3.

(a) (10%) Find the voltage v_1 and v_2 for the circuit shown below.



(b) (10%) Solve for the power delivered to the 8-Ω resistance and solve for the node voltages v_1 and v_2 shown below.



Problem 4.

Consider the circuit of Figure 4.

(a) (10%) Please find I_{CQ} (I_C at the quiescent operating point) and r_π.

(b) (10%) Calculate values for the voltage gain $A_v(= v_o/v_{in})$ and output impedance Z_o.

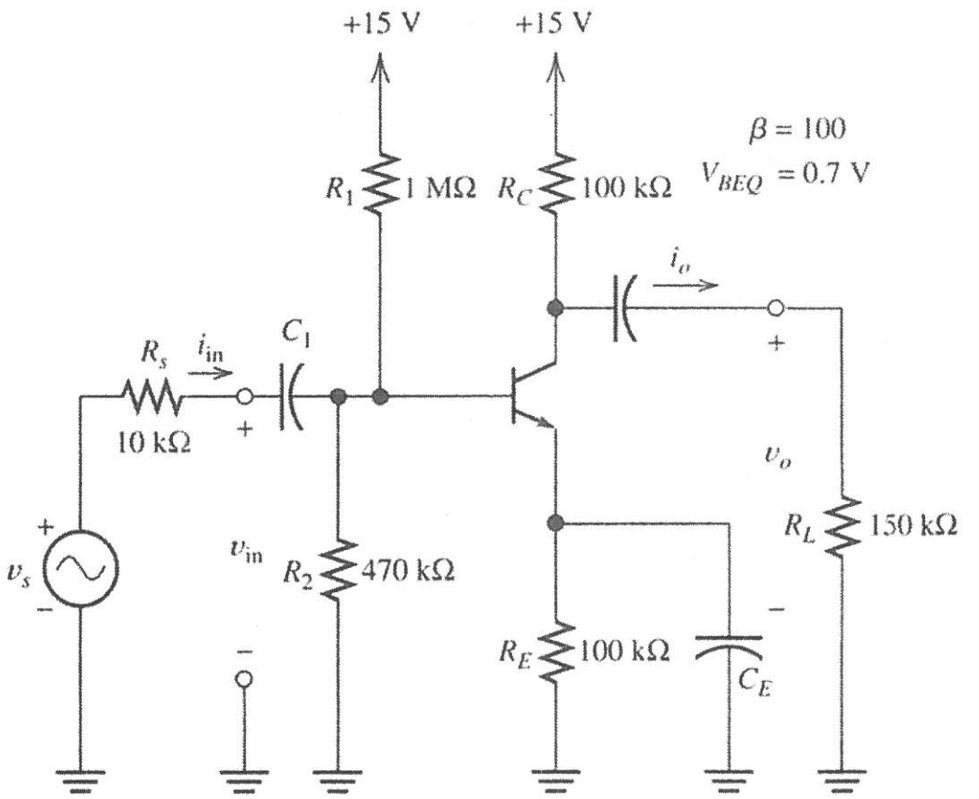


Figure 4

Problem 5.

(15%) Consider the circuit of Figure 5. The enhancement transistor has threshold voltage V_T = 1 V and conductance parameter K = 0.5 mA/V^2. Determine the value of R.

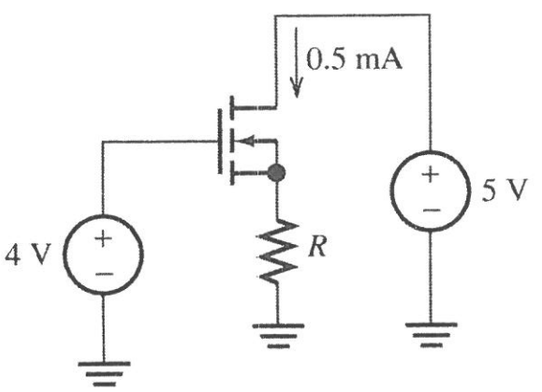


Figure 5

Problem 6.

(15%) Consider the circuit of Figure 6. Please find the diode D_1, D_2 states and explain the reasons. Assume ideal diodes.

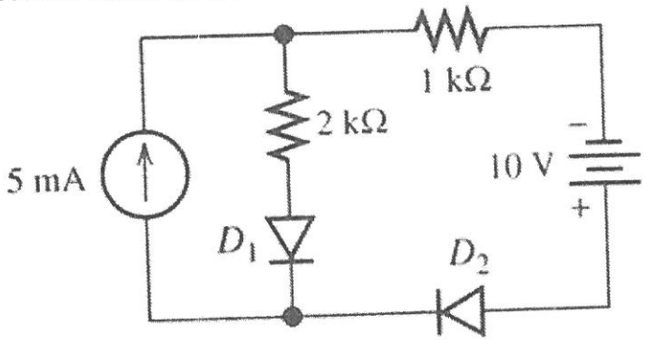


Figure 6