EE101 Final Examination, 4-7 p.m. March 20, 2018

Name_____ Student ID_____

2 pages of formulas and tables only are allowed. But, you must show all your work even when you apply formulas to get full credits. Otherwise, you will lose points.

Problem 1 [10] _____

Problem 2 [5] _____

Problem 3 [10] _____

Problem 4 [10] _____

Problem 5 [10] _____

Problem 6 [10] _____

Problem 7 [10] _____

Problem 8 [5] _____

Problem 9 [5] _____

Problem 10[10] _____

Problem 11[5] _____

Problem 12[10] _____

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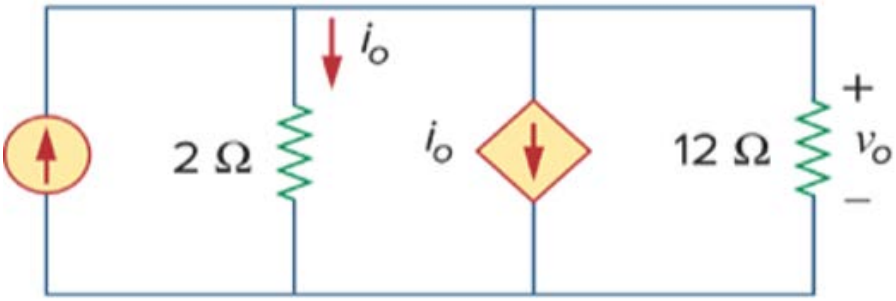
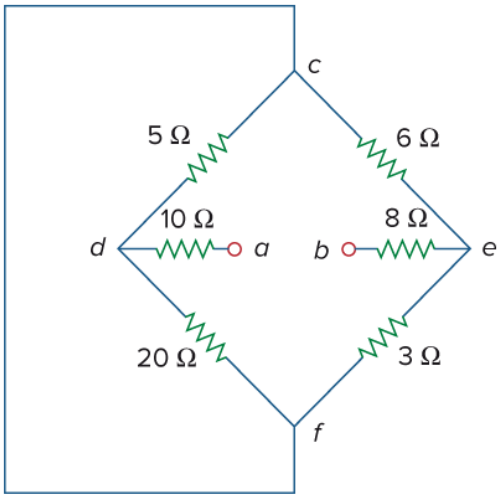
TOTAL [100] _____

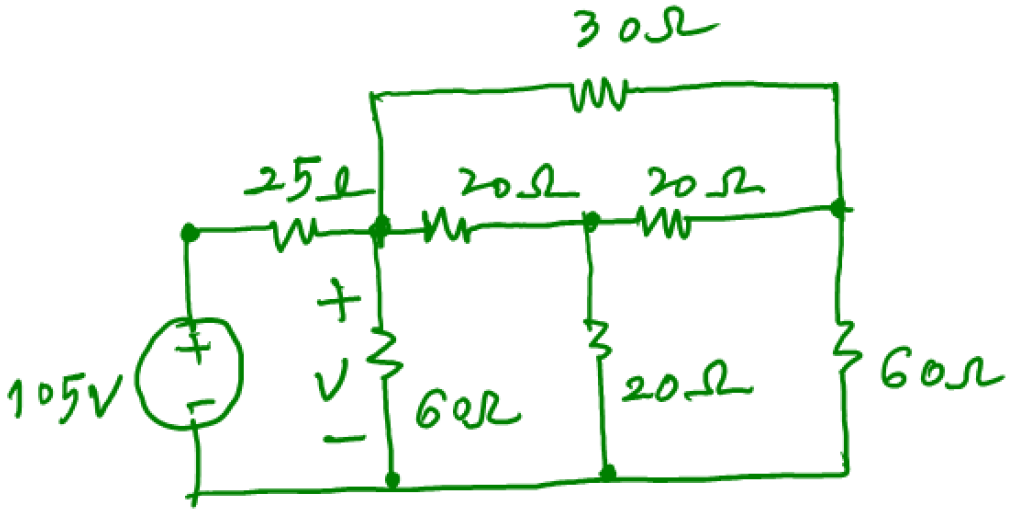
[1] (10 points) Find **the current i_o and voltage v_o** for a current source of 13 A.



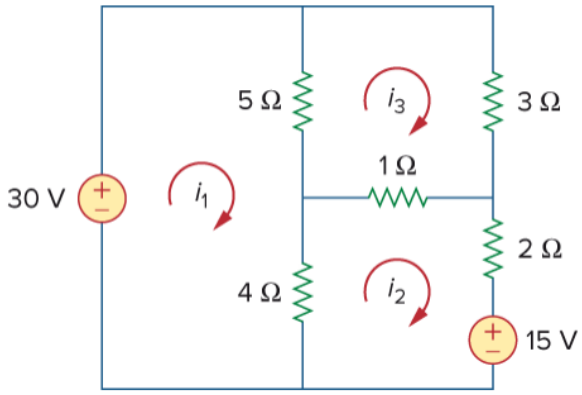
[2] (5 points) Find the equivalent resistance between **terminal a and terminal b**.



[3] (10 points) Calculate **the voltage V** in the circuit below.



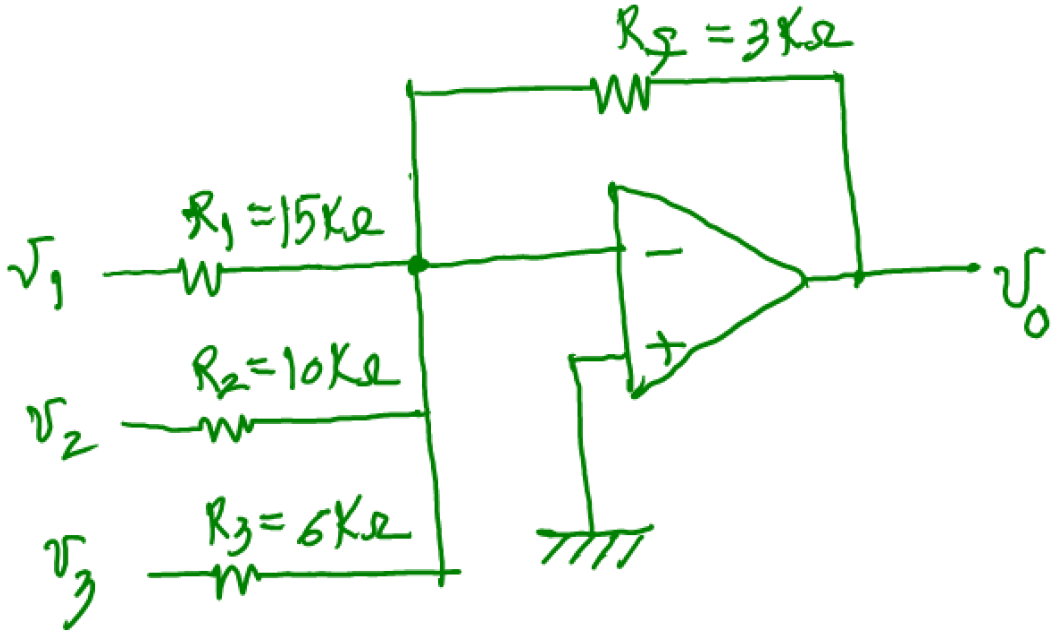
[4] (10 points) Find the **mesh current i_1**.



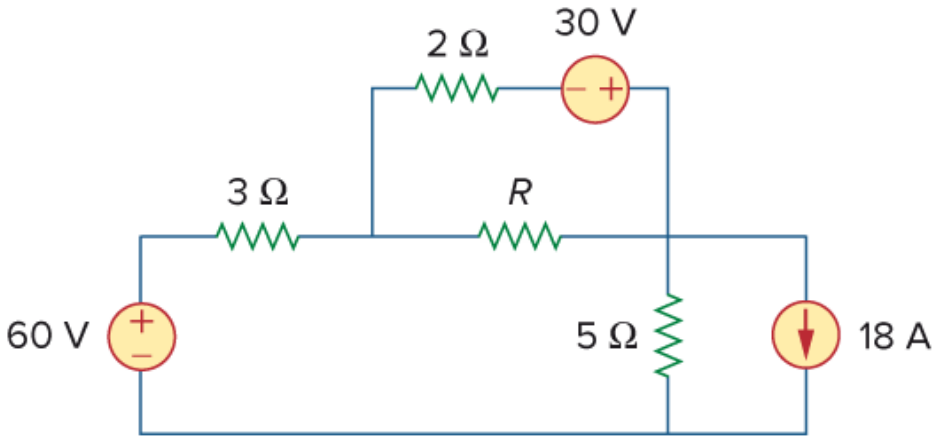
(for continuation of problem 4 solution)

[5] (10 points) (a). (8 points) Find an **expression for V_o** in terms of V_1, V_2, and V_3.

(b). (2 points) What is **the value of V_o** when (V1, V2, V3) = (75, 80, 90)?

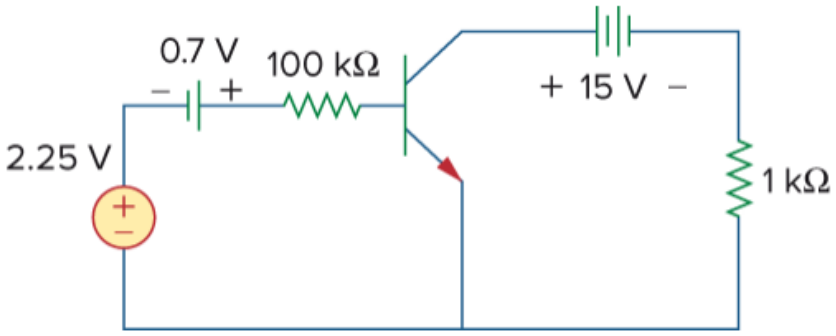


[6] (10 points) Find the maximum power that can be transferred **to resistor R** in the circuit below and **find its maximum power dissipation**.

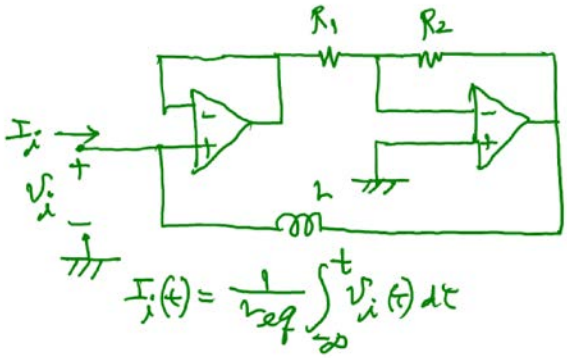


(continuation of problem 6 solution)

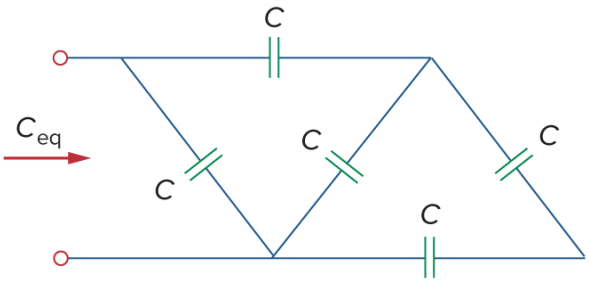
[7] (10 points) **Find the voltage across the collector and emitter terminals (V_{CE})** of the bipolar junction transistor (BJT) below with β=100 and V_{BE}=0.7 V for the circuit below.



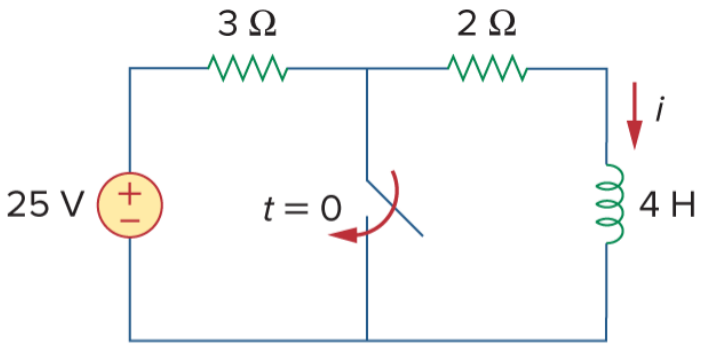
[8] (5 points) Find an **expression for L_{eq}** in terms of R_1, R_2 and L.



[9] (5 points) Find $\mathbf{C_{eq}}$ of the following capacitor network.

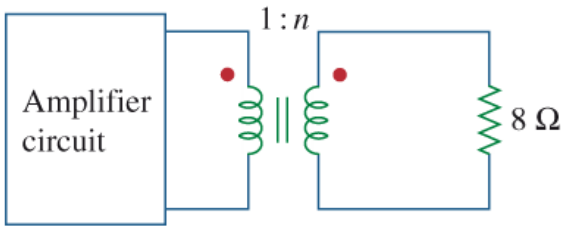


[10] (5 points) Find the inductor current **i(t) and $\frac{di(t)}{dt}$ for t = 0- and for t = 0+.**



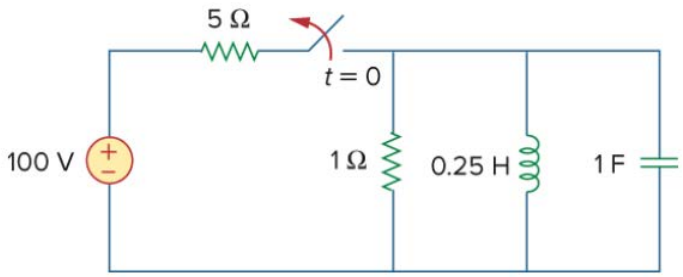
[11] (5 points) Determine **the transformer ratio n** for maximum power transfer to the 8 Ω load when the Thevenin's equivalent voltage and the equivalent resistance for the amplifier circuit are 10V and 128 Ω. Assume that the transformer is an **ideal transformer** which is lossless, unity coupled and its self-inductances of the primary and secondary ports are infinitely large.

(Hint: $V_2 = n\, V_1$ and $I_2 = I_1 / n$)



[12] (10 points) Find the voltage across 1F capacitor **v (t) for t > 0.**

(Hint: determine for t > 0 whether the circuit is overdamped, critically damped or underdamped so that you can start solving for v (t) with a particular equation form.)



(Prob. 12 solution continued)