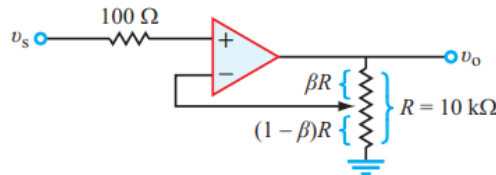


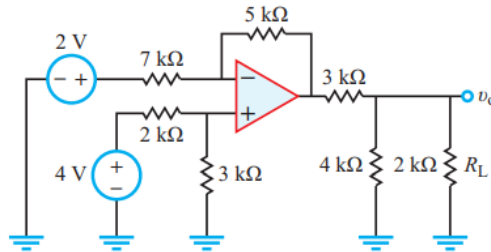
ECEN203 Analogue Electronics and Systems: Homework 2 (5%)

Attempt all 7 questions. Show your solution steps clearly. Total = 39 marks.

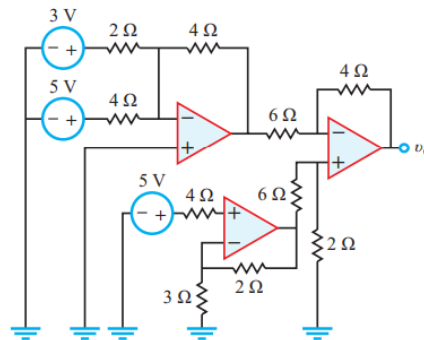
Q1. [3 marks] The circuit in the figure below uses a potentiometer whose total resistance is $R = 10\text{ k}\Omega$ with the upper section being βR and the bottom section $(1-\beta)R$. The stylus can change β from 0 to 0.9. Obtain an expression for $G = v_o/v_s$ in terms of β and evaluate the range of G (as β is varied over its own allowable range).



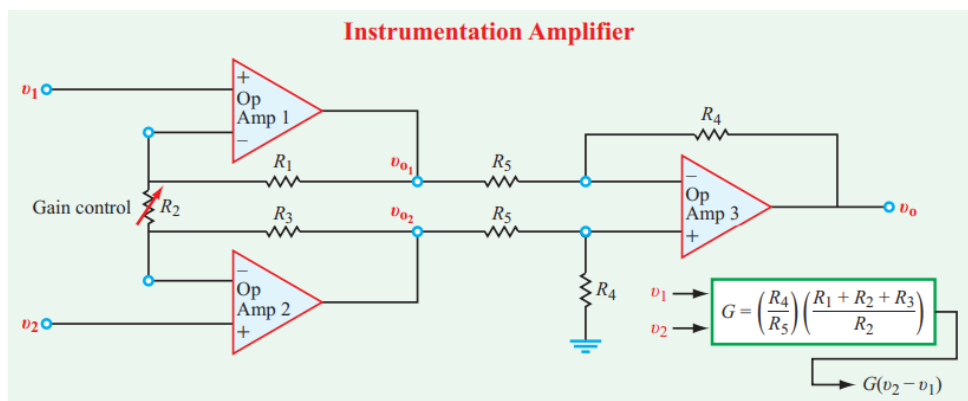
Q2. [8 marks] Determine v_o and the power dissipated in R_L in the circuit below.



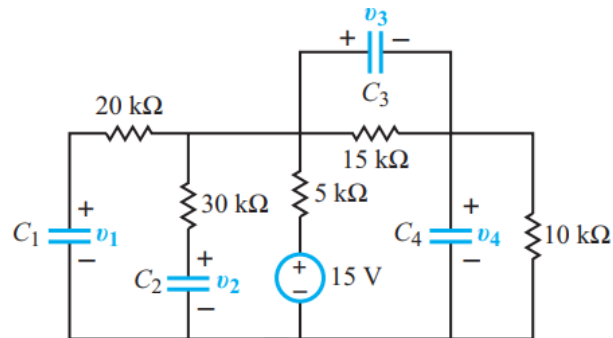
Q3. [6 marks] Solve for v_o in the circuit below.



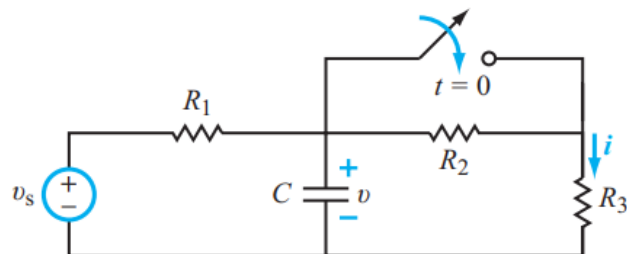
Q4. [3 marks] The instrumentation-amplifier circuit shown below is used to measure the voltage differential $\Delta v = v_2 - v_1$. If the range of variation of Δv is from -10 to $+10\text{ mV}$ and $R_1 = R_3 = R_4 = R_5 = 100\text{ k}\Omega$, choose R_2 so that the corresponding range of v_o is from -5 to $+5\text{ V}$.



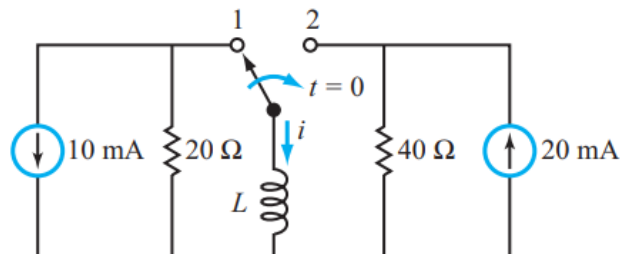
Q5. [6 marks] Determine voltages v_1 to v_4 in the circuit below under dc conditions. Also draw the circuit under dc condition.



Q6. [7 marks] Determine $i(t)$ for $t \geq 0$ where i is the current passing through R_3 in the circuit below. The element values are $v_s = 16$ V, $R_1 = R_2 = 2$ k, $R_3 = 4$ k, and $C = 25$ μ F. Assume that the switch had been open for a long time prior to $t = 0$. Draw the relevant circuits in your working steps.



Q7. [6 marks] The switch in the circuit below was moved from position 1 to position 2 at $t = 0$, after it had been in position 1 for a long time. If $L = 80$ mH, determine $i(t)$ for $t \geq 0$. Draw the relevant circuits in your working steps.



~ End of Homework 2 ~