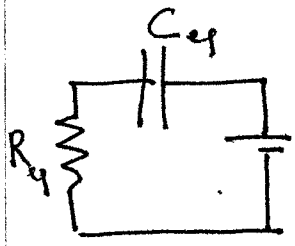
Review Session

Issues discussed:

(1) RC circuits. You should know →

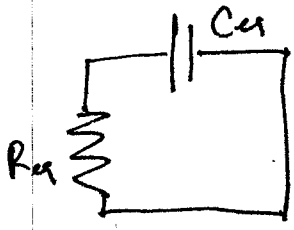
single loop RC circuit
(perhaps w/ equiv. R_{eq} + C_{eq} → reducing series + parallel combinations)



$\tau = R_{eq} C_{eq}$

← Charging → Initial charge 0

$Q(t) = \mathcal{E} C_{eq} (1 - e^{-t/\tau})$



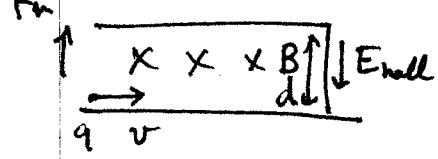
Discharging → initial charge Q_0

$Q(t) = Q_0 e^{-t/\tau}$

$I(t) = \frac{dQ(t)}{dt}$

(2) Hall Effect → basic physics.

Know that E field induced s.t. eventually $qE_{Hall} = qv_d B$

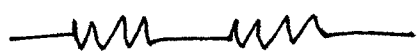


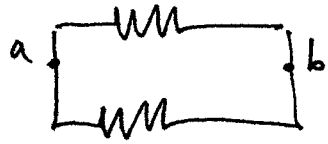
$E_{Hall} = \frac{V_{Hall}}{d}$ $\quad v_d = \frac{I}{nqA}$

$A = \text{Area} = dt$ ↓ thickness →

$$\boxed{V_H = \frac{IB}{nqt}}$$

(3) Kirchhoff Rules.

Recognize series  (same I in each)

Recognize parallel  (same V across each)

↓

often useful to reduce more complicated circuits. (Can still use Kirchhoff even if you don't reduce, of course)

General
- Assign currents clearly. Label figure!! → can combine these steps.

Examples.
- Apply junction conditions
- Apply loop rule for each indep current.

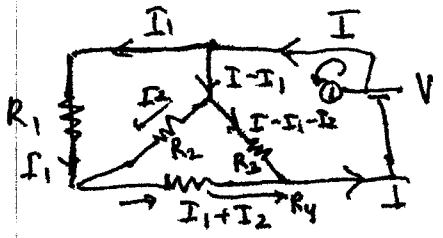
26.82

Asked for → R_{eq}

R_1 + R_2 in parallel but others not so easily reducible.

Just do it using Kirchhoff →

Assign currents



loops → ① $V - (I - I_1 - I_2)R_3 = 0$ right loop

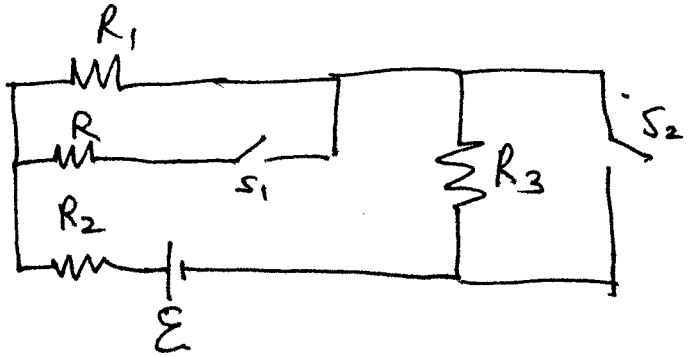
② $V - I_1 R_1 - (I_1 + I_2)R_4 = 0$ (outer edge)

③ $-I_2 R_2 - (I_1 + I_2)R_4 + (I - I_1 - I_2)R_3 = 0$ triangular loop

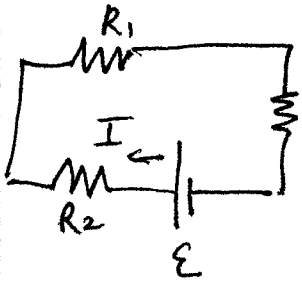
Solve. Getting this far is 75% - 80% credit.

26.80 Given → current through R_1 same depends on which switches both closed or both open. Given: $R_1, R_2, R_3, \mathcal{E}$.

asked for → R.

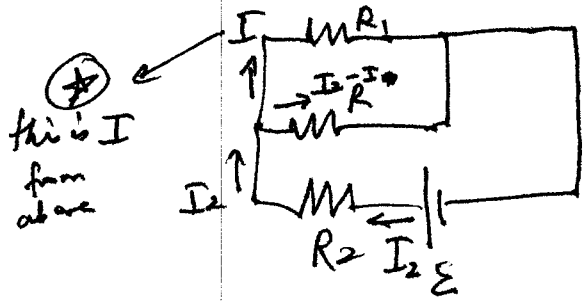


Both open → equiv circuit (open switch = no current through that branch)



$$\mathcal{E} - I(R_1 + R_2 + R_3) = 0 \quad (\star)$$

Both closed → short out R_3, open up R branch:



(*) this is I from above

$$\mathcal{E} - I_2 R_2 - I R_1 = 0$$
$$I_1 R_1 - (I_2 - I) R = 0$$

$I_1 + I_2$

eliminate I_2, solve → for R.

Last

Practice midterm Problem #4.

Very Important!! Do it!!

(See MT exam soln).

the end. Good luck!!!