SECOND MIDTERM

$\sigma = 9.2$

Name (print) KEY. Name (signed)

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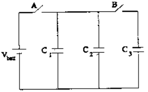
Discussion Section #

SHOW ALL WORK!!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

In the arrangement shown, switch A is closed for a while and then opened. After A is open switch B is closed.



(a) Find the potential on each capacitor after B is closed.
(b) Calculate the charge on each capacitor after B is closed.

$V_{batt} = 175$ V
$C_1 = 1.25\ \mu F$
$C_2 = 2.40\ \mu F$
$C_3 = 3.00\ \mu F$

a) Initially when A is closed, B open C_1 & C_2 are being charged the two are in ‖'l. so $Q_{tot} = Q_1 + Q_2 = (C_1 + C_2)V$

$Q_1 = C_1 V = 1.25\times10^{-6} \times 175 = 2.19\times10^{-4}$ C

$Q_2 = C_2 V = 2.40\times10^{-6} \times 175 = 4.2\times10^{-4}$ C

$Q_{1,2} = Q_1 + Q_2 = 6.39\times10^{-4}$ C

$C_{1,2} = C_1 + C_2 = 3.65\ \mu F$

When switch A is opened and B closed we have;

have $V_{1,2} = V_3 = V$ (for all three capacitors since they're in ‖'l.)

(7)

so $V = \frac{Q}{C} = \frac{Q_{1,2}}{C_1 + C_2 + C_3} = \frac{Q_{1,2}}{C_{tot}} = \frac{6.39\times10^{-4}}{6.65\times10^{-6}}$

(12)

$\therefore V = 96.1$ V

b)

$Q_3 = VC_3 = 96.1 \times 3\times10^{-6} = 2.88\times10^{-4}$ C

$Q_2 = VC_2 = 96.1 \times 2.40\times10^{-6} = 2.31\times10^{-4}$ C

$Q_1 = VC_1 = 96.1 \times 1.25\times10^{-6} = 1.20\times10^{-4}$ C

(6)

−1 units
−1 sig figs