George Williams

THIRD MIDTERM Average : 13.4

Name (print) Apostol Gramada Name (signed) _____

Discussion Instructor (circle): Gramada Hansen Li Zhukov

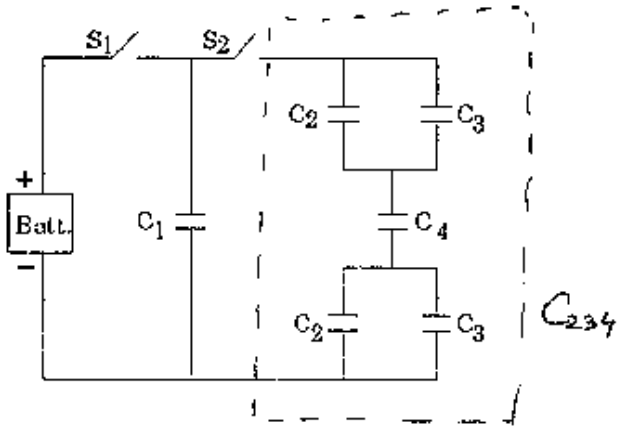
Discussion Section # _____

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

For the network shown, S_1 is closed for a long time with S_2 open. S_1 is then opened and S_2 closed. S_1 remains open.

(a) With S_2 closed, find the potential on C_1.
(b) With S_2 closed, calculate the charge on C_4.
(c) With S_2 closed, what is the charge on C_2?

$V_{batt} = 120$ V
$C_1 = 250$ pF
$C_2 = 150$ pF
$C_3 = 100$ pF
$C_4 = 225$ pF



a) The total charge after S_1 is opened and S_2 closed is:

$Q = C_1 V_{batt} = 30 \times 10^{-9}$ C ~ 3p.

$C_{234} = \left(\frac{1}{C_2+C_3} + \frac{1}{C_4}\right)^{-1} = 80.36$ pF $\simeq 80.4$ pF

$C_{eq} = C_1 + C_{234} = 330.4$ pF ≈ 330 pF ~ 3p.

$V_1 = Q/C_{eq} = 90.8$ V (10p)

b) $Q_{23} = Q_2 + Q_3 = Q_4$; $Q = Q_1 + Q_{23}$; $Q_1 = V_1 C_1 = 2.27 \times 10^{-8}$ C

$Q_4 = Q - Q_1 = (30 - 22.7) \times 10^{-9} = 7.30 \times 10^{-9}$ C (5p)

c) $Q_2 + Q_3 = 7.30 \times 10^{-9}$ C
$\frac{Q_2}{C_2} = \frac{Q_3}{C_3}$
} solve the system $\Rightarrow$ $Q_2 = 4.38 \times 10^{-9}$ C (10p)

* Credit was ~~lost~~ given for meaningful work.