# Assignment 4: Chapter 25 & Chapter 26

## Deadline

Friday, January 8th, 2020 … before 4:00 pm

## Notes

1. Attempt all the questions given for each chapter in an A4 Size Paper.
2. Clear mention on the title page your assignment no.,Section, name and registration id.
3. Submit your assignments in Google Classroom by scanning your assignments in a single PDF using Cam scanner or MS Lens before the deadline.
4. Plagiarism will result in zero marks as well as black listing of the student.
5. answers are already uploaded along with the assignment.

## Chapter 25: Capacitance

### P1.

a) A parallel-plate capacitor has circular plates of 8.20 cm radius and 1.30 mm separation. (a) Calculate the capacitance. (b) Find the charge for a potential difference of 120 V.(Ans: (a) $C = 144pF$ (b) $q = 17.3$ nC)

### P2.

In Figure, the capacitances are $C_1$ = 1.0 µF and $C_2$ = 3.0 µF, and both capacitors are charged to a potential difference of V = 100 V but with opposite polarity as shown. Switches $S_1$ and $S_2$ are now closed. (a) What is now the potential difference between points a and b? What now is the charge on capacitor (b) 1 and (c) 2?(Ans: (a) $V_{ab} = 50V$ (b) $q1$ =$5.0 \times 10^{-5}$ C (c) $q2 = 1.5 \times 10^{-4}$ C )
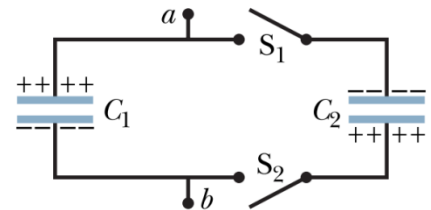
### P3.

What capacitance is required to store energy of 10 kWh at a potential difference of 1000 V? (Ans: **C=72F**)

### P4.

A parallel-plate air-filled capacitor having area 40 cm² and plate spacing 1.0 mm is charged to a potential difference of 600 V. Find (a) the capacitance, (b) the magnitude of the charge on each plate, (c) the stored energy, (d) the electric field between the plates, and (e) the energy density between the plates. (Ans : (a) C = 35 pF (b) Q=**21 nC** (c) U=*6.3µJ* (d) *E= 600 KV/m* (e)U= $1.575 J/m^3$)

**P5.**

A coaxial cable used in a transmission line has an inner radius of 0.10 mm and an outer radius of 0.60 mm. Calculate the capacitance per meter for the cable. Assume that the space between the conductors is filled with polystyrene. (Ans: $\frac{C}{L} = $ $\mathbf{80.6\ pF/m}$)

**P6.** 6 uF capacitor is connected in series with 4 uF capacitor, a potential difference of 200V is applied across the pair (a) calculate equivalent capacitance (b) what is charge on each capacitor (c) what is potential difference across each capacitor? (Ans: **a) 2.4uF**          **b) 480uC**          **c) V6 = 80V, V4 = 120V)**

**P7.** A parallel plate capacitor has circular plates of 8.22cm radius and 1.31mm separation. (a) calculate the capacitance (b) what charge will appear on plates if potential difference of 116V is applied? (Ans: **a) 143pF b) 1.66× 10$^{-8}$ C)**

**P8.** A 32uF capacitor is connected across a programmed power supply. During the interval from t=0 to t=3s the output voltage of supply is given by v(t)=6+4t-2t^2 volts. At t=0.5s find (a) the charge on capacitor (b) the current into the capacitor and (c) the power output from the power supply.(Ans:**a)240uC , b)64uA c)480uW )**

**P9.** A parallel plate capacitor has plate with dimensions 3cm x 4cm separated by 2mm. the plates are connected across a 60V battery. Find (a) capacitance (b) the magnitude of charge on each plate.(Ans: **a) 5.31pF b)3.19× 10$^{-10}$C**

**P10.**   In figure 1 find equivalent capacitance of a combination. Assume that C1 = 10.3uF , C2 = 4.8uF and C3 = 3.9uF( Ans: **Ceq = 3.09uC)**

**P11.**   For a circuit in figure 2 find (a) the equivalent capacitance (b) the charge and potential difference for each capacitors.(**a) 12uF   , b) V1 = 16V ,V4 = 8V ,V2=V3=24V)**

fig #1                                                fig #2
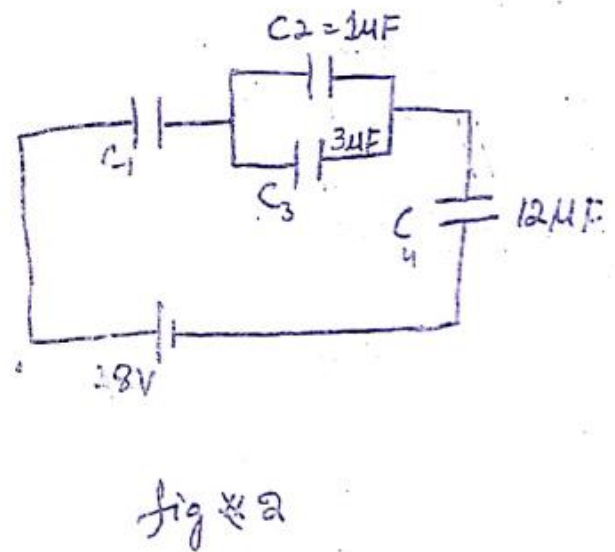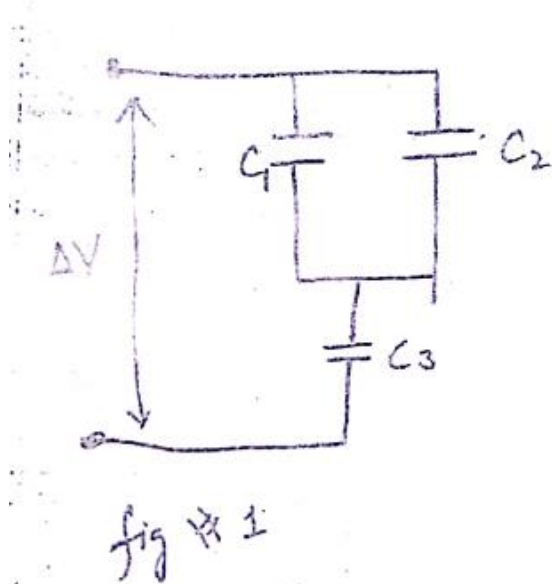
# Chapter 26: Current & Resistance

**P12.**   Suppose that the material composing a fuse melts once the current rises to 440A/cm^2. What diameter of cylinder wire should be used for the fuse to limit the current to 0.552A?(Ans: $\mathbf{d = 0.0039\ cm}$)

**P13.**   How long does it take electrons to get from a car battery to the starting motor? Assume that the current is 115A and the electrons travel through copper wire with cross-sectional area 31.2mm^3 and length 85.5cm. (n = 8.49x10^28 m^-3)(Ans: $\mathbf{t = 3151x \times 10^9\ sec}$)

**P14.**   A fluid with resistivity 9.4Ωm seeps into the space between  the plates of 110pF parallel plate air capacitor when the space is completely filled what is the resistance between plates (Eo = 8.86 pF/m) (Ans:$\mathbf{R = 7.5x \times 10^{23}\ \Omega}$

**P15.**   For a hypothetical electronic device, the potential difference V in volts, measured across the device, is related to the current "I" in mA by V = 3.55i^2.  (a) find resistance when current is 2.4mA.  (b) at what value of current is resistance 16 Ω (Ans: **a)** $\mathbf{R = 8.52x \times 10^{-3}\ \Omega}$      **b) i = 45.07 A)**

**P16.**   A student's 9V, 7.5W portable ratio was left on from 9:00pm to 3:00am. How much charge has passed through the wires?  (Ans : $\mathbf{q = 18000\ C}$)