EXPERIMENT 4

CHARACTERISTICS OF RC CIRCUITS

OBJECTIVE: The object of the experiment is to learn the timing characteristics of RC circuits.

PRELIMINARY WORK (Solve the preliminary work and include in your report. You can plot the graph with any software you want)

P1 For the RC circuit shown in Figure 6.1 **find** and **plot** $V_C(t)$ for charging and discharging periods for the component values $R_1=33K\Omega$, $R_2=27K\Omega$ $R_3=15K\Omega$ and $C=2200\mu F$. Switch is in position 1 for the time intervals 0<t<200 and it is in position 2 for the time intervals 200<t<500. Assume capacitor is initially uncharged

Charging period (t = 0, 5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100, 120, 150, 200 sec.)

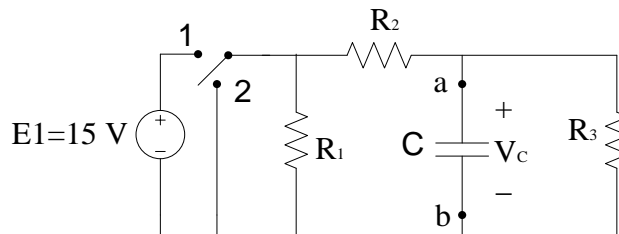Discharging period (t = 205, 210, 215, 220, 240, 250, 260, 280, 300, 300,320, 350, 400, 450, 500 sec.)

Figure 6.1

P2 Calculate the energy stored in the capacitor given in P1 at charging and discharging time intervals. Charging phase is 0-200 sec. Discharging phase is 200-500 sec.

EQUIPMENT

Digital Multimeter (DMM)
Oscilloscope
Power Supply
Capacitors
Resistors

EXPERIMENTAL WORK (Use the following link for the simulation. Create an account before beginning the simulation)

E1 Set up the circuit in Figure 6.1. Using the same time intervals as in P1 obtain and plot the capacitor voltage $V_C(t)$ with Time Domain simulation. (The circuit that you will build for charging capacitor should look like the one given in Figure 6.2. Also, make sure you use time domain simulation and enter desired values. For the charging capacitor it is shown in Figure 6.3)
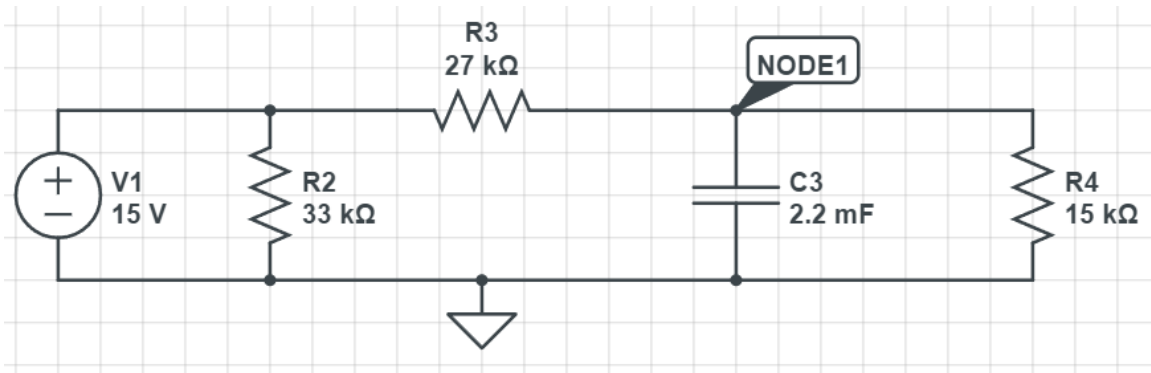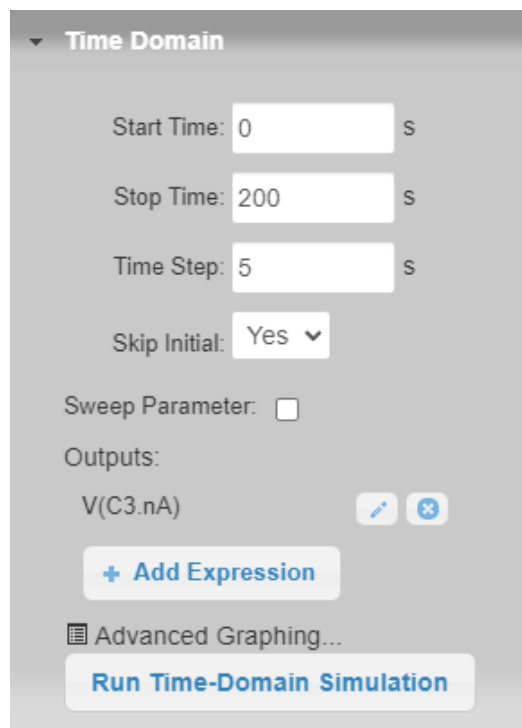

Figure 6.2

Figure 6.3

CONCLUSION

C1 Compare the plots you obtained in P1 and E1. Comment for any discrepancies

C2 Obtain the time constant of the circuit from the plots you obtained in E1. Is it same as in P1 or not? Why?