Assignment # 1:

Note that:

- Last Date for the Submission of Assignment # 1 is Fri, 2 October 2015
- Late submission will result in deduction of 20% marks per day.
- Assignment # 1 can be submitted individually or in group of 2 students. (Number of students in a group can not exceed 2)
- Make sure to mention your names along with "NUST registration numbers" on the assignment
- (Your registration numbers list has been uploaded to the "Topics Covered" section of the website

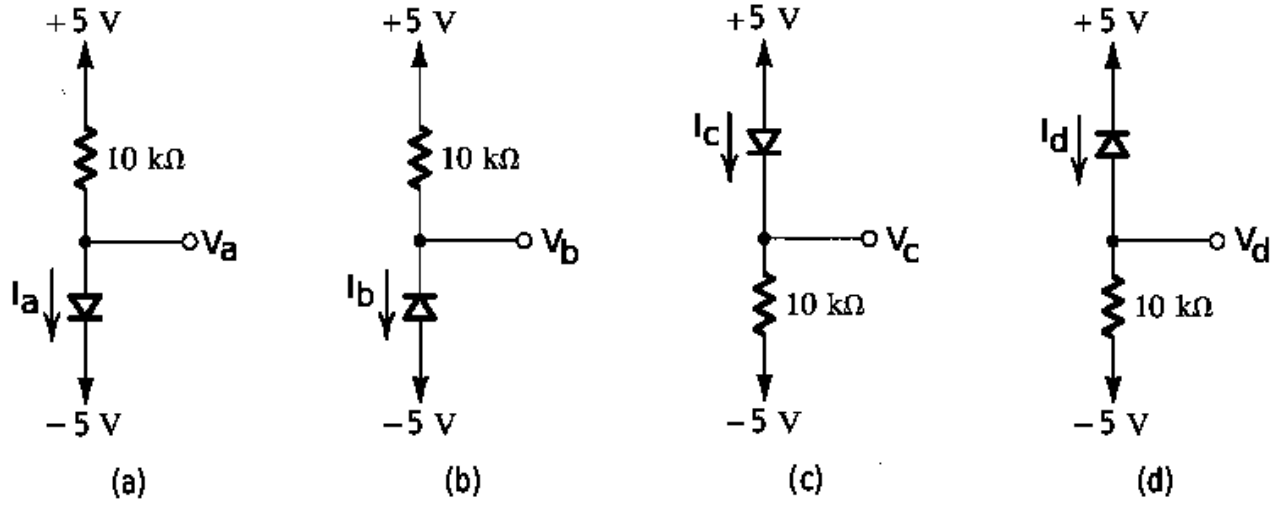
---

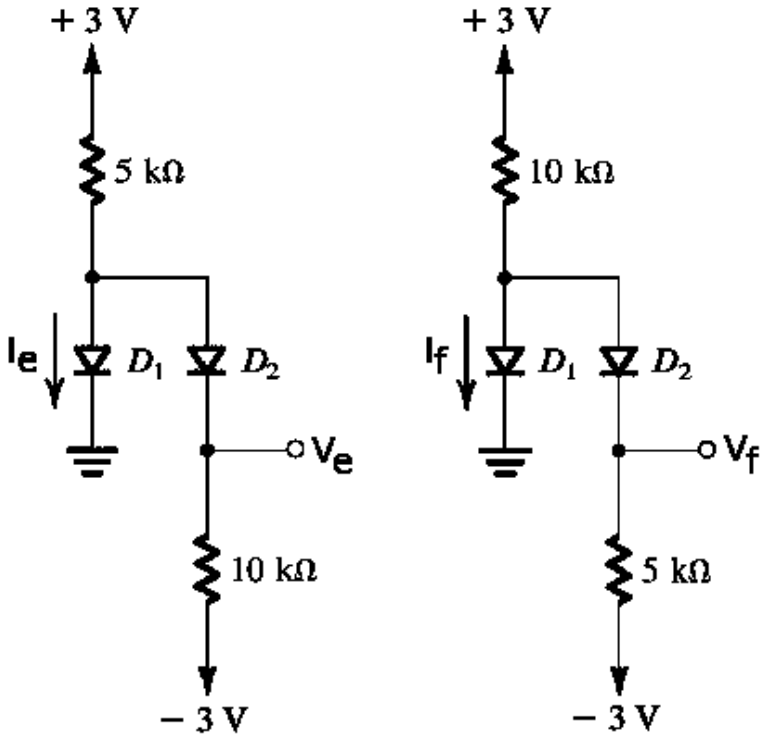
- for LTSpice setup and 'Getting Started guide' visit the following link
  - http://www.linear.com/designtools/software/#LTspice

- for Matlab (or Octave), you need to know the following function/commands
  - plot
    - in matlab/octave type the following to get help regarding this function,
    - help plot
  - hold
    - in matlab/octave type the following
    - help hold
  - axis
    - in matlab/octave type the following
    - help axis

Question 1

- (a.) For the circuits shown in figure below, Use Constant-Voltage-Drop-Model to determine the values of the labeled voltages and currents.
-

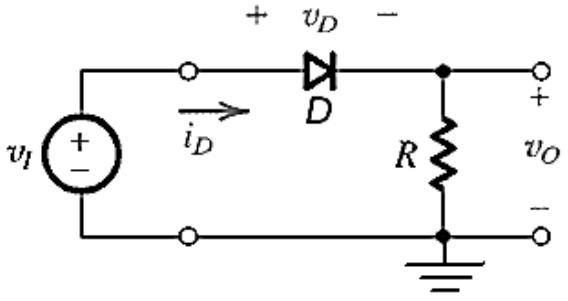




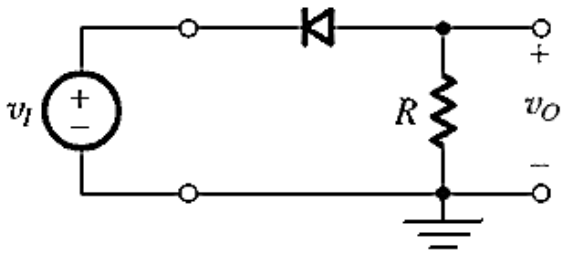
- (b.) Use LTSpice to analyze the circuits (using transient analysis for $1\mu s$) in Q1(a.). Assume that the diodes are 1N4148. (Note that a model for this diode is available in LTSpice library)
    - Note: Submit separate plots for each current and voltage.

Question 2

- (a.) Use LTSpice to analyze the rectifier circuit shown in figure below. Here plot the output voltage v_O in LTSpice using transient analysis for 0.1s. Let $R = 1k\Omega$ and $v_I = 12\sin(100\pi t)$. Assume that the diode is 1N4148. (Note that a model for this diode is available in LTSpice library)



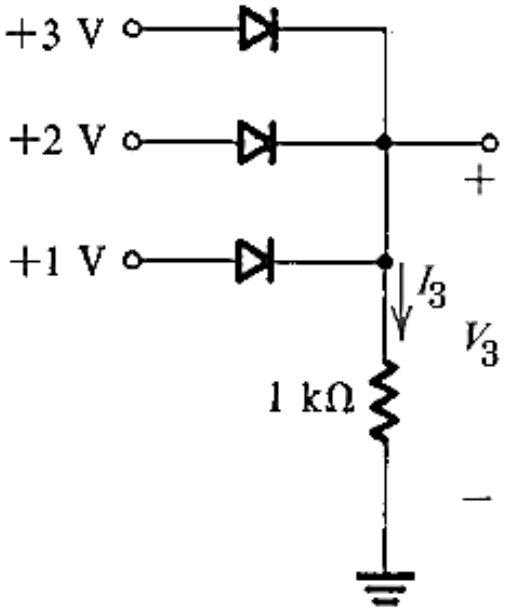
- (b.) Repeat Q2(a.) if a capacitor of value $100\mu F$ is connected in parallel with R.
- (c.) Use LTSpice to analyze the rectifier circuit shown in figure below. Here plot the output voltage v_O in LTSpice using transient analysis for 0.1s. Let $R = 1k\Omega$ and $v_I = 12\sin(100\pi t)$. Assume that the diode is 1N4148. (Note that a model for this diode is available in LTSpice library)



- (d.) Repeat Q2(c.) if a capacitor of value $100\mu F$ is connected in parallel with R.

Question 3:

- (a.) For the circuit shown in figure below, use Constant Voltage drop model to determine the labeled current and voltage.
- (b.) For the circuit shown in figure below, use "Exponential Model" to determine two equations in two unknowns. For these diodes $I_S = 5 \times 10^{-16}$ A.
- (c.) Use "Graphical Analysis" to plot the two equations obtained in part (b.) and determine the labeled voltage and current.
    - Note:
    - Use either Matlab or Octave to obtain the final solution.
    - Submit the Matlab/Octave Code
    - Submit the Matlab/Octave Plot
- (d.) Use "Iterative Analysis" to determine the labeled voltage and current.



- (e.) Use LTspice to determine I_3 and V_3. (using transient analysis for $1\mu s$)
    - Assume that the diodes are 1N4148. (Note that a model for this diode is available in LTSpice library)
    - Note: Submit separate plots for each current and voltage.
