Simulation Exercise: Temperature dependance

Part-1: Dark Forward Characteristics

1. Modify the netlist written for I/V characteristics of a solar cell in the previous section.
2. Run the simulation to measure the dark forward characteristics at 35^0C, 45^0C, 55^0C, 65^0C, and 75^0C.
3. Note the values of V_D for I_D=1mA, 2mA and 5mA.
4. Fill up in the observation table 1 below. Calculate η for low forward bias (1mA) and for high forward bias (5mA) at all the temperatures.

Sr.No	$V_D$for I_D=1mA	V_D for I_D=2mA	$V_D$for I_D=5mA	η for I_D=1mA	η for I_D=5mA
35^0C					
45^0C					
55^0C					
65^0C					
75^0C					

Table 1

Part-2: Lighted I/V Characteristics

In this part, we will plot the I/V characteristics of the solar cell when used as a power source. We will measure I/V characteristics at various temperatures when the solar cell is lighted at the intensity to generate I_L=8mA.

1. A load resistor R is connected across the solar cell. The value of R is varied from 1 to 500Ω and the values of I_L and V_L are recorded for the temperatures 35^0C to 75^0C in steps of 10^0C.

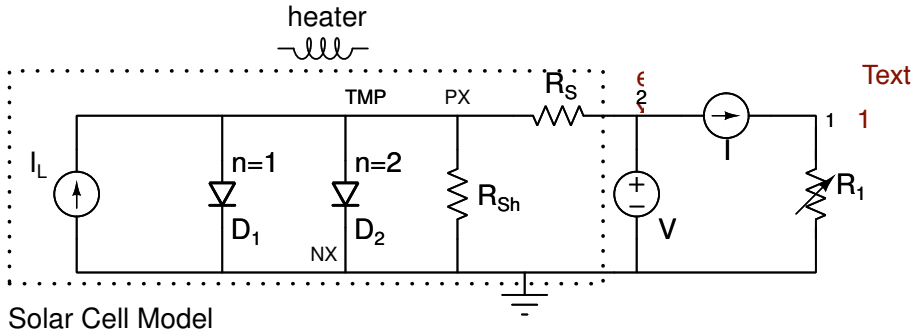

Figure 1: Solar Cell used as power source operated at different temperatures

2. Plot I_D-V_D and P_L-V_D characteristics under lighted condition at all the temperatures. Note the values of Voc and Isc values for all temperatures.

3. Obtain Fill Factor (FF) for all the temperature and plot FF v/s temperature.

4. Plot V_D v/s Temp and V_oc v/s Temp. You will get three sets of V_D for I_D = 1mA, 2mA and 5mA obtained in Part-1.

5. Comment on the dependence of V_{oc}, I_{sc}, and FF.