Lab # 07

Designing Solar Panel in Simulink

Aim:

In this lab we will learn about how to model and design solar panel using Simulink.

Component Used:

The following components will be used when we model a solar panel in Matlab Simulink.
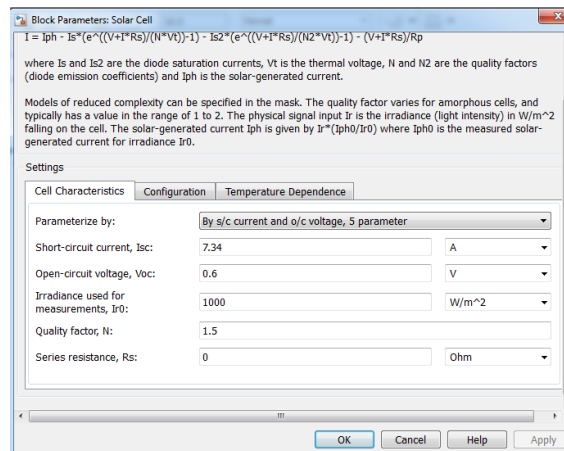
a) Solar Cell:

The Solar cell block represents a solar cell current source. The solar cell model includes the following components:
- Solar-Induced Current
- Temperature Dependence
- Thermal Port
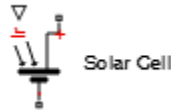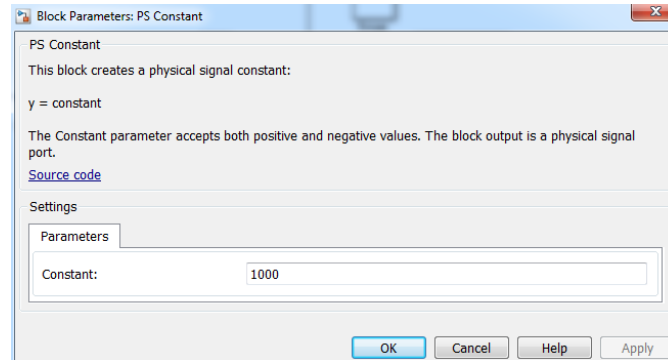

Dialog Box and Parameters:

b) PS Constant:

The PS Constant block generates a physical signal of a constant value. You specify the value of the signal as the Constant parameter.
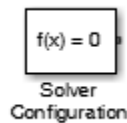
Dialog Box and Parameters:

Constant:

Constant is the signal value. You can specify both positive and negative values. The block has one physical signal output port.

c) Solver Configuration:

Each physical network represented by a connected Simscape block diagram requires solver settings information for simulation. The Solver Configuration block specifies the solver parameters that your model needs before you can begin simulation. Each topologically distinct Simscape block diagram requires exactly one Solver Configuration block to be connected to it.

The block has one conserving port. You can add this block anywhere on a physical network circuit by creating a branching point and connecting it to the only port of the Solver Configuration block.

Dialog Box and Parameters:
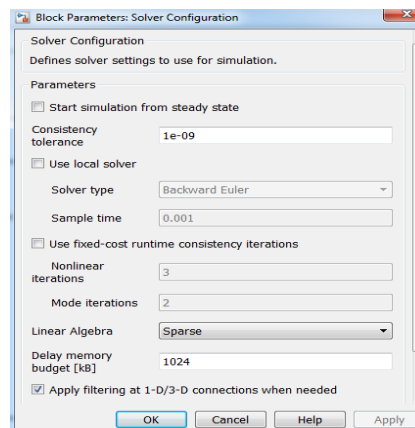
d) PS-Simulink Converter:

The PS-Simulink Converter block converts a physical signal into a Simulink output signal. Use this block to connect outputs of a Physical Network diagram to Simulink scopes or other Simulink blocks. The Output signal unit parameter lets you specify the desired units for the output signal. The block has a physical signal input port, located on its left side, and a Simulink output port, located on its right side (in the block default orientation).

PS-Simulink
Converter

e) Voltage Sensor:

The Voltage Sensor block represents an ideal voltage sensor, that is, a device that converts voltage measured between two points of an electrical circuit into a physical signal proportional to the voltage. Connections + and – are electrical conserving ports through which the sensor is connected to the circuit. Connection V is a physical signal port that outputs the measurement result.
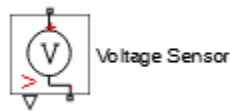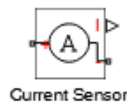

Voltage Sensor

The block has the following ports:

- + Electrical conserving port associated with the sensor positive terminal.
- - Electrical conserving port associated with the sensor negative terminal.
- V Physical signal output port for voltage.

f) Current Sensor:

The Current Sensor block represents an ideal current sensor, that is, a device that converts current measured in any electrical branch into a physical signal proportional to the current.
Connections + and – are electrical conserving ports through which the sensor is inserted into the circuit.
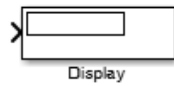Connection I is a physical signal port that outputs the measurement result.

Current Sensor

The block has the following ports:

- + Electrical conserving port associated with the sensor positive terminal.
- - Electrical conserving port associated with the sensor negative terminal.
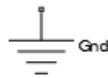- I Physical signal output port for current.

g) Scope:

Scope

h) Display:

Display

i) Product:
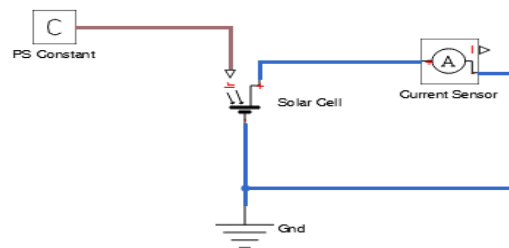

Product

**j) Resistor:**

Resistor

**k) Ground:**

Gnd

Procedure:

Connect solar cell as shown. Connect its first terminal with PS Constant the second terminal with current sensor and the terminal pointing downward with ground.
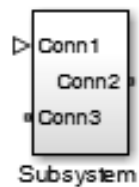

After connecting this single solar cell take two more cells and connect them in series as shown. By connecting more solar cells in series will gives us more power in the output.
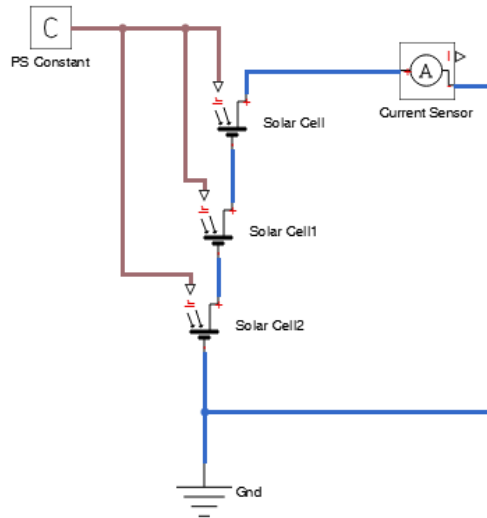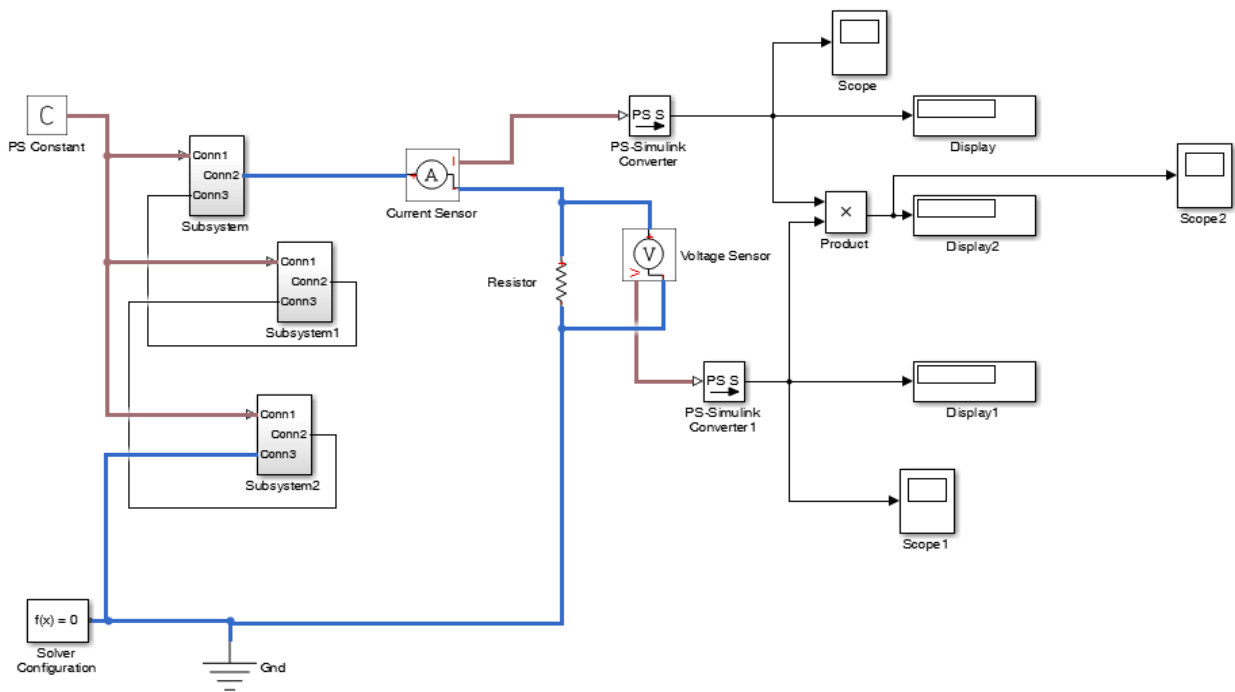
Now select these three cells, then right click on them and then click on create subsystem from selection.
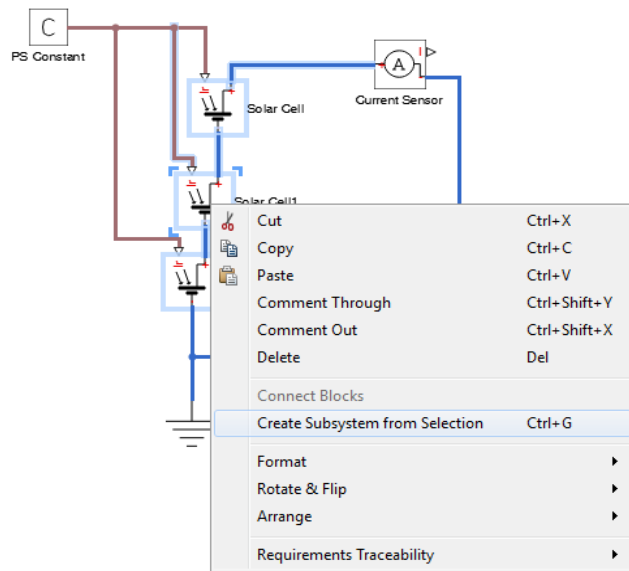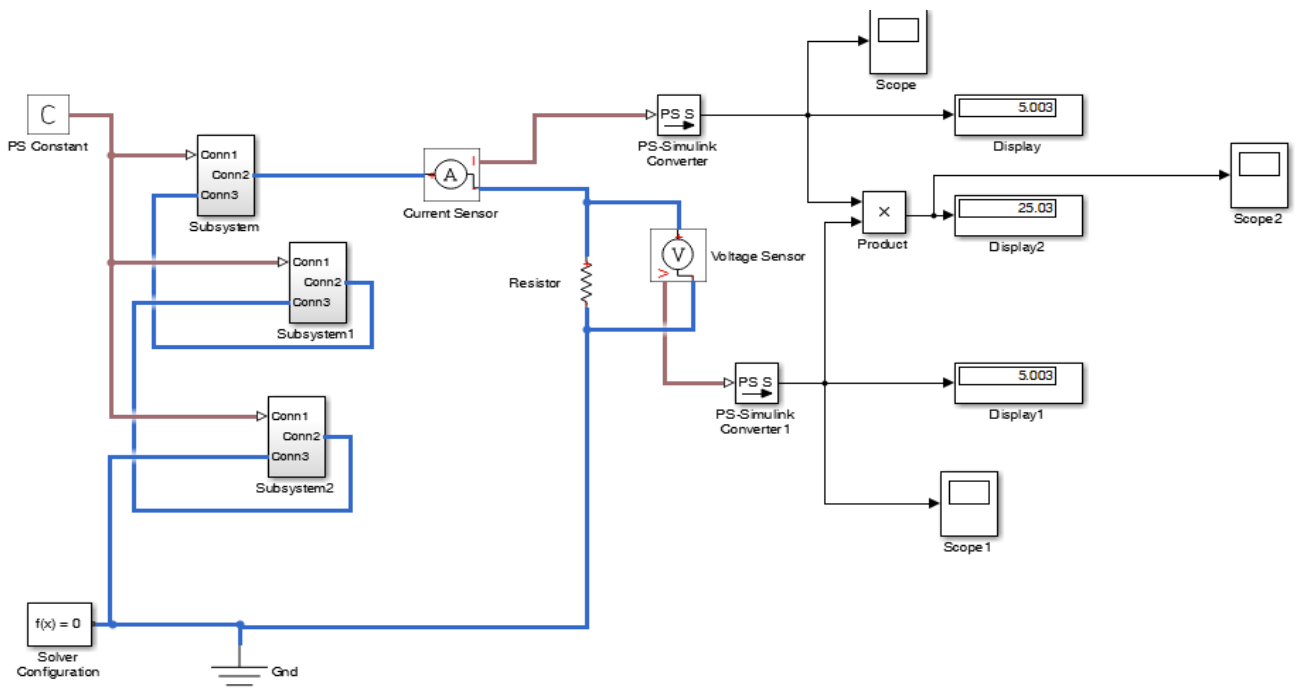

By doing this the solar cells will be packed in a subsystem as shown.

Now connect all the components as shown.

After connecting run the simulation. And note the voltage, current and power.

Lab Task:

    a) Design a single solar cell and then calculate output power.

    b) Design the 72 cells solar panel.

    c) Calculate output power of 72 cells solar panel.

Marks Obtained: ……………………….   **Remarks:** ……………………