

Individual Performance Test [Spring 2020-21], Mid Term

Renewable Energy Technology Lab [A]

Marks: 20

Student Name:	Das, Sourav
Student ID:	18-3740--1
Group No:	2

Instructions:

- There are four questions based on the design statement.
- If your question says **ID+15** then use last **two digits of your ID before the hyphen** and **then add 15**. For example, If ID: 18-782**53**-2, then use 53 and add 15. In this case, **ID+15 = 53+15 = 68**.
- Rename your file name as your **student ID**.
- Rename the PV array used in the simulation as your **student ID**.
- Each screenshot should be taken in a manner which shows the **current time in your laptop/desktops**.
- Copied/identical submissions will be graded as 0.**
- After finishing, convert the word file into **PDF format** and submit it in Microsoft teams (assigned assignment Section)

Design Statement: Design a PV Station with the following requirement.

- Maximum power (P_{max}) = (**ID+15**) **MW (approximate the power as close as possible)**
- Open Circuit Voltage (V_{oc})=**1.5 kV (1500 V)**
- PV panel model: **Kyocera Solar KC200GT**
- PV Cell Irradiance: **1000 W/m² and PV cell temperature: 25°C**

Now based on the above criteria answer/fill out the below questions.

Q1. How many PV panels are required in series and parallel? Show necessary calculation.
You can paste your notebook picture or type the calculation.

[5]

ID = 18-37400-1

Last 2 digit = 00

Maximum power (P_{max}) = (ID+15) MW

$$= (00 + 15) \text{ MW}$$

$$= 15 \text{ MW}$$

Open Circuit Voltage (V_{oc}) = **1.5 kV (1500 V)**

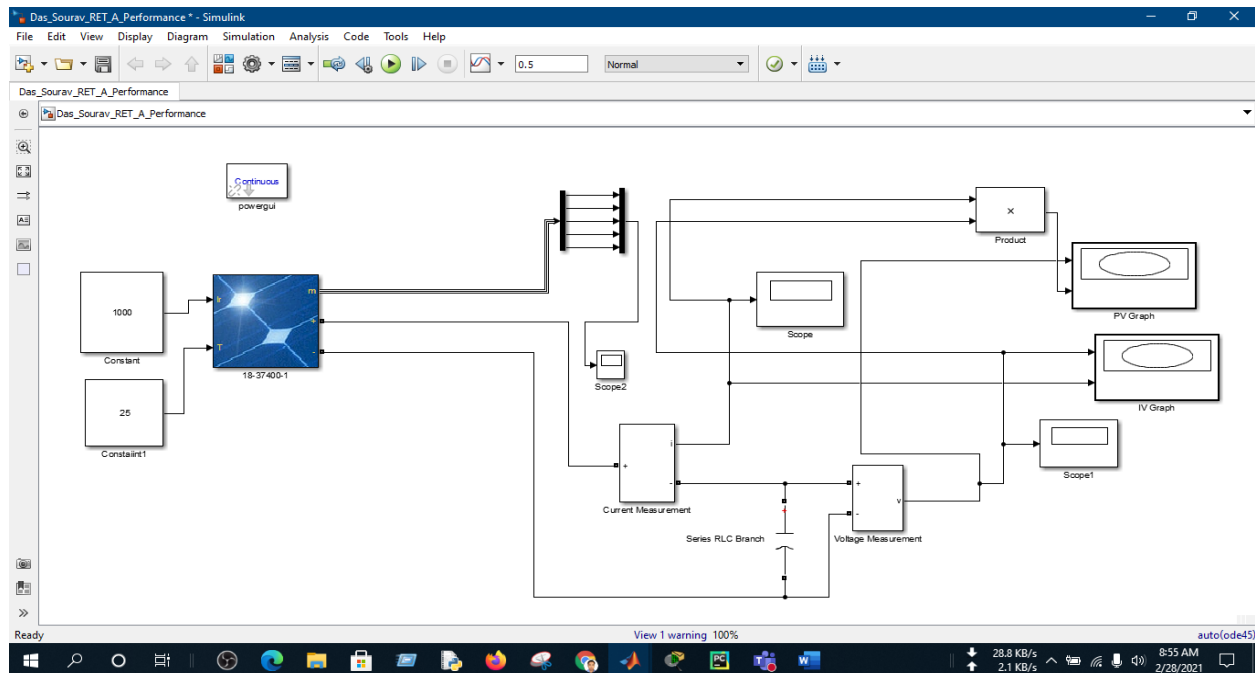
So, Short Circuit current = $P_{max}/V_{oc} = 15\text{e}6/1500 = 10000 \text{ A}$

Now, PV panels are required in series = $(1500/32.9) = 46$

And, PV panels are required in parallel = $(10000/8.21) = 1219$

Q2. Paste the snapshot of the layout of PV panel with capacitive load.

[5]



Q3. Paste the block parameters snapshot after double clicking on the PV module in Matlab Simulink for the designed PV station.

[5]

Block Parameters: 18-37400-1

PV array (mask) (link)

Implements a PV array built of strings of PV modules connected in parallel. Each string consists of modules connected in series. Allows modeling of a variety of preset PV modules available from NREL System Advisor Model (Jan. 2014) as well as user-defined PV module.

Input 1 = Sun irradiance, in W/m2, and input 2 = Cell temperature, in deg.C.

Parameters **Advanced**

Array data

Parallel strings: 1219

Series-connected modules per string: 46

Module data

Module: Kyocera Solar KC200GT

Maximum Power (W): 200.143

Cells per module (Ncell): 54

Open circuit voltage Voc (V): 32.9

Short-circuit current Isc (A): 8.21

Voltage at maximum power point Vmp (V): 26.3

Current at maximum power point Imp (A): 7.61

Temperature coefficient of Voc (%/deg.C): -0.35502

Temperature coefficient of Isc (%/deg.C): 0.06

Display I-V and P-V characteristics of ...

array @ 1000 W/m2 & specified temperatures

T_cell (deg. C) [25]

Plot

Model parameters

Light-generated current IL (A): 8.2288

Diode saturation current IO (A): 2.3246e-10

Diode ideality factor: 0.97736

Shunt resistance Rsh (ohms): 150.6921

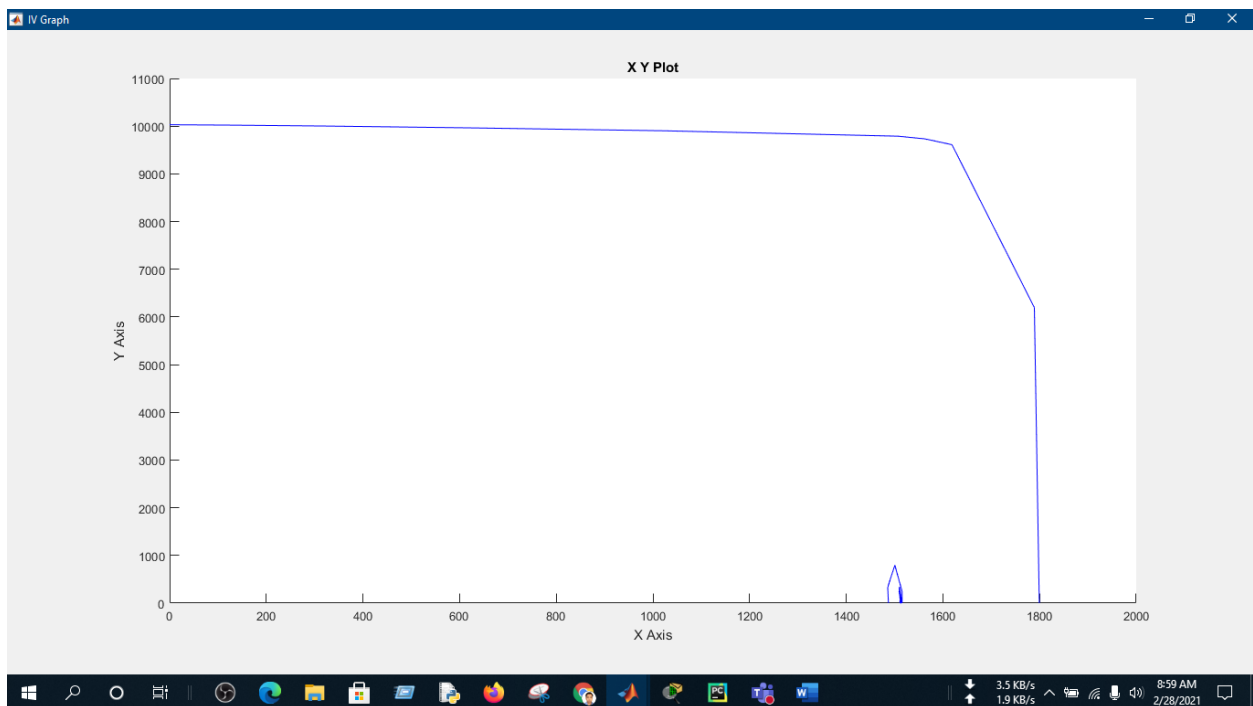
Series resistance Rs (ohms): 0.34483

OK **Cancel** **Help** **Apply**

Q4. Paste the **I-V** and **P-V** characteristics graphs snapshots for the above criteria.

[5]

I-V:



P-V:

