

## Experiment 5:

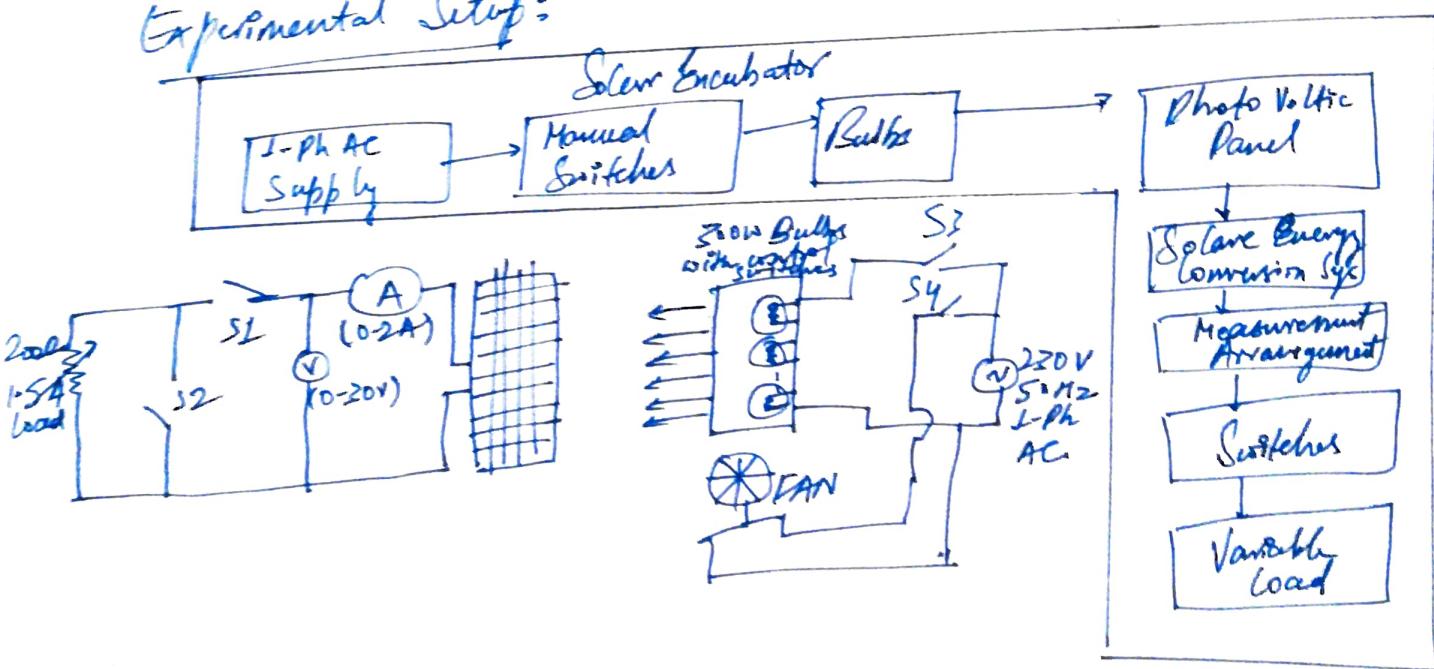
### Study of Solar PV Panel V-I Characteristics:

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AIM: Study of a solar PV energy conversion system (SPVELS) to understand its basic characteristic and working principle.

- To familiarize the solar PV based experimental setup.
- To understand the experimental procedure for measurement and observation
- To realize the experimental cases for characterization under 3 different study condition
  - Varying the load
  - under different Intensity of light
  - Under dark Condition.

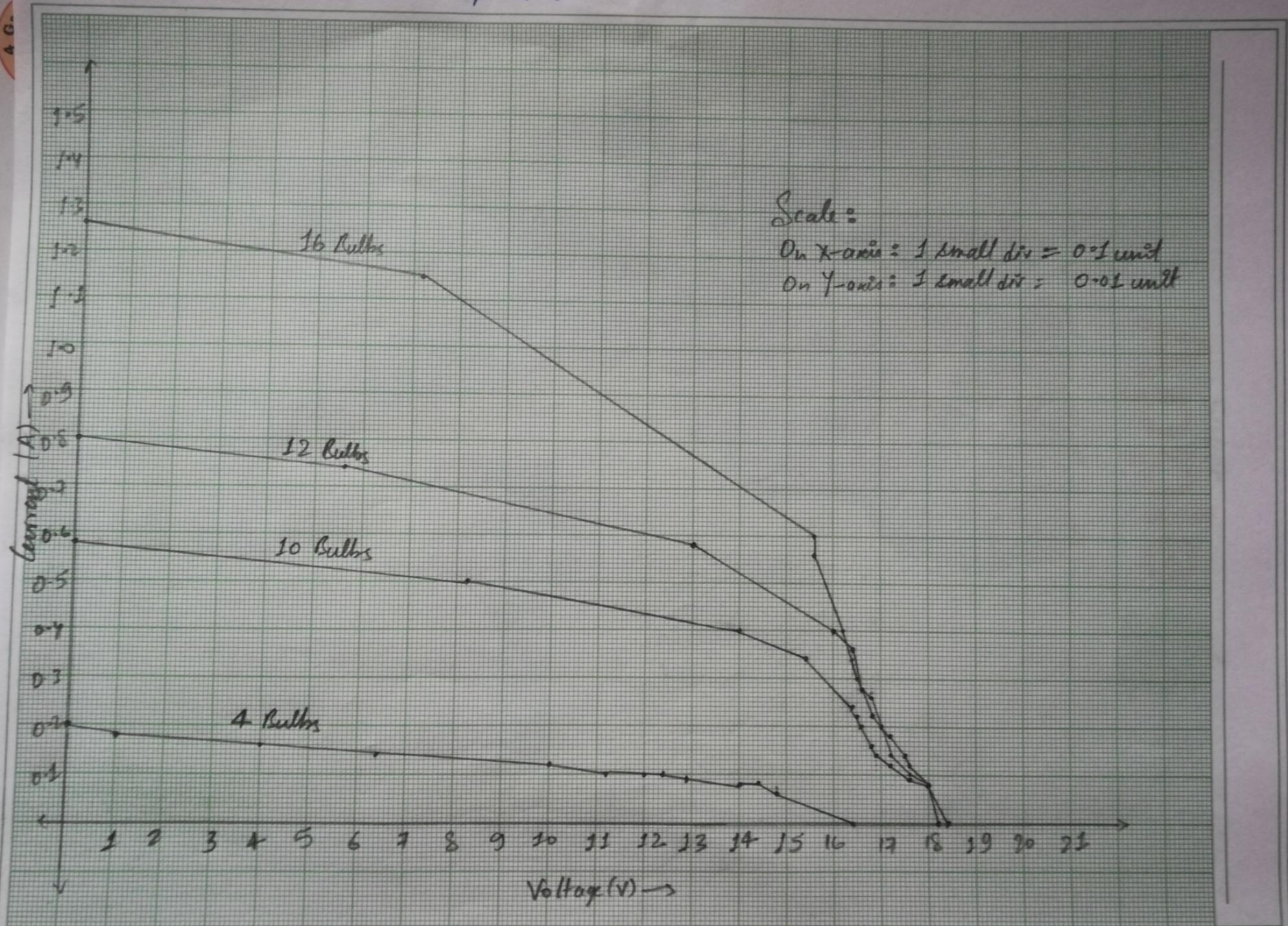
### Experimental Setup:



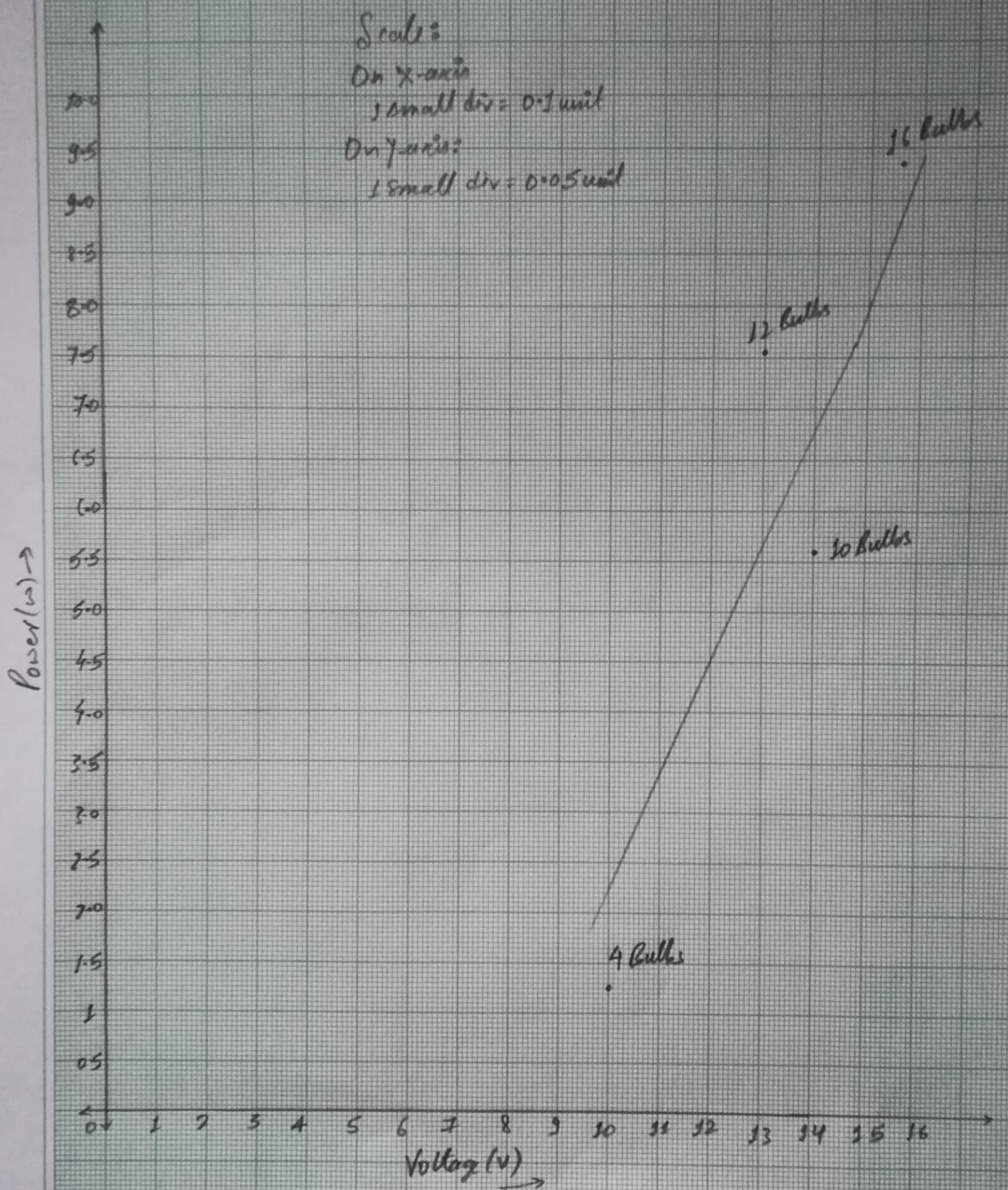
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I-V Graph of the Solar Panel

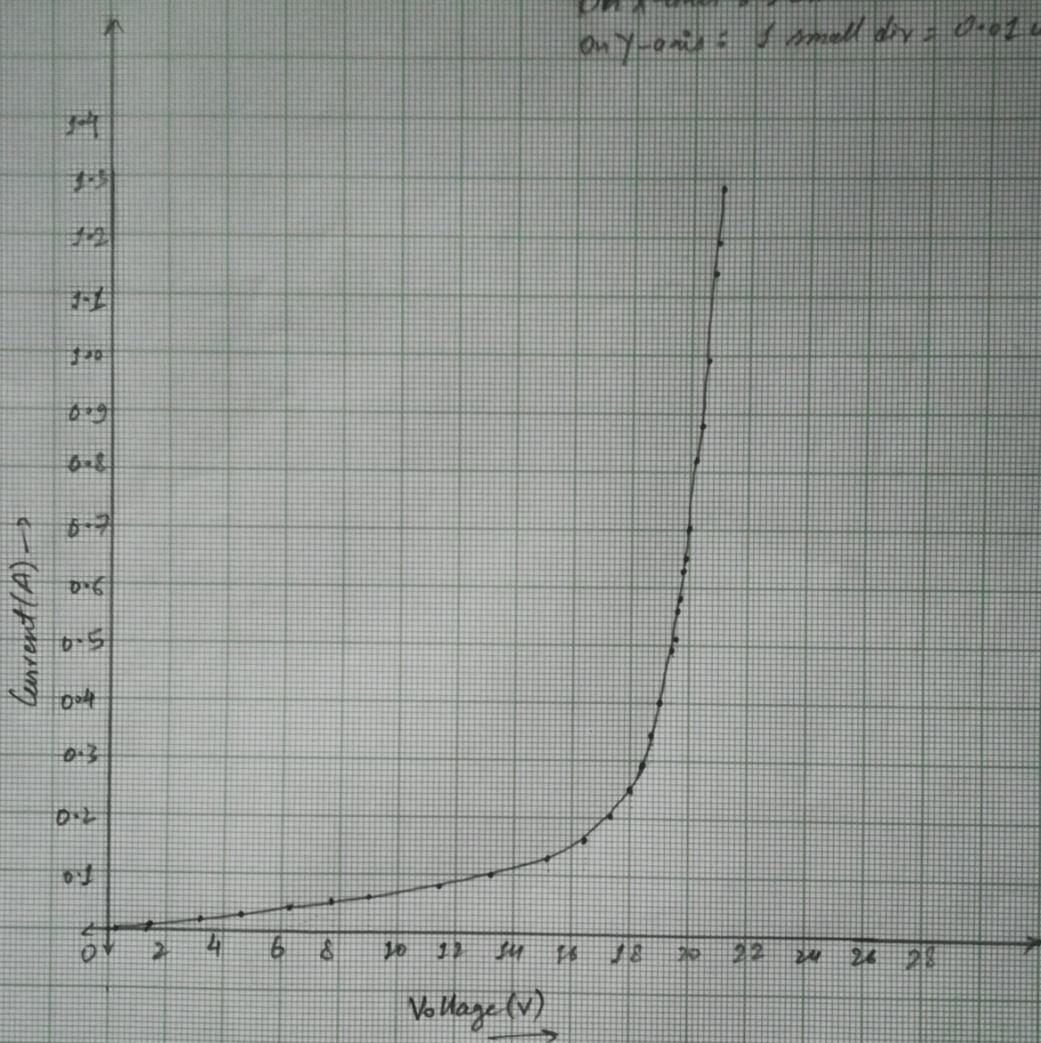
A.G.



MPP Curve of the Solar Panel , Pratyush Jainwal , 18EE30021



Case 2, Pratyush Jainwal, 18EG30021

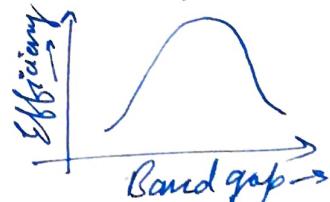


## DISCUSSION :

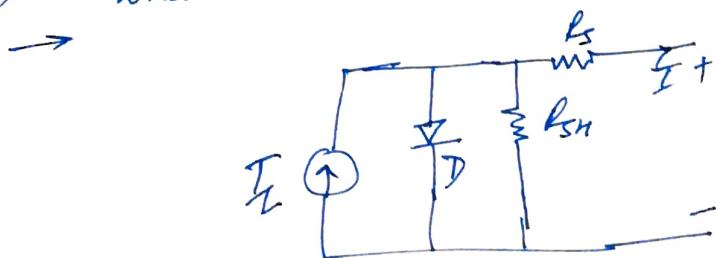
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1) what is the impact of the Band gap energy on the efficiency of a Solar PV cell?

→ low band gap materials can be used to capture low energy photons and high band gap molecules can be used for capturing high energy photons. Combinations of different band gap materials allow for more efficient use of available radiation. If the band gap is too high, most photons will not cause photoelectric effect and if the band gap is too small then significant amount of energy will convert to heat. So the maximum efficiency of a solar cell depends on the bandgap.



2) Draw the accurate equivalent circuit of Solar PV cell?



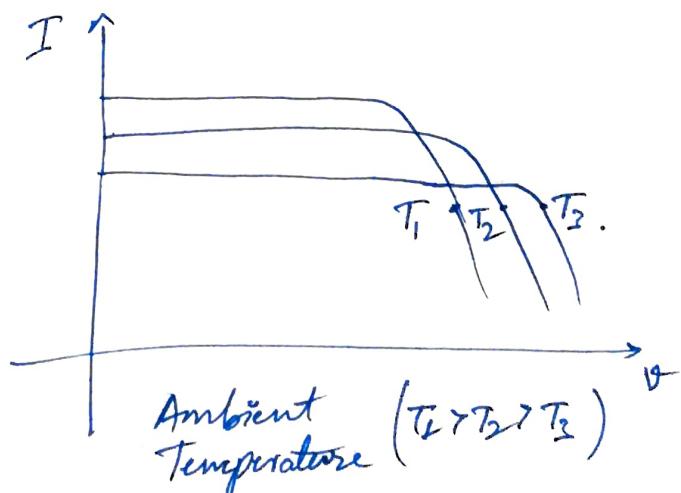
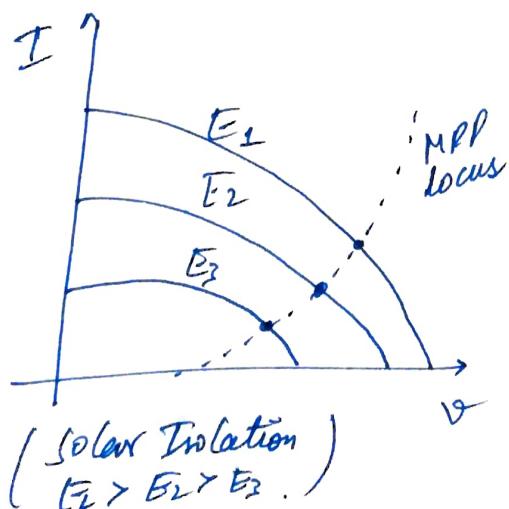
$I_o$ : Photocurrent - It represents the current due to the electron and hole produced by photoelectric effect.

$R_s$ : Series Resistance - It is the resistance taken into consideration because of the resistance offered to the current by PV material itself.

$R_{sh}$ : Shunt Resistance - After the electrons & holes are produced due to photoelectric effect, some of them recombine & some current don't flow through load. It is represented as a shunt resistance path through which some current comes back.

D: Diode - It is used to represent the reverse path through which current flows in also opposite direction in PV material as voltage difference is created between the terminals of the PV material.

- 3) What is the significance of Fill factor (FF)? What is the difference between efficiency and FF of a Solar cell?
- If on the solar cell, only  $V_{oc}$  and  $I_{sc}$  are mentioned, then we won't be able to tell what will be the maximum power that can be generated from it. So FF can be used to determine the maximum power that can be generated from the solar cell and it also gives idea about the IV characteristics of the solar cell.  
 Fill factor can be generated from the solar cell whereas efficiency determines the proportion of the energy incident on the solar cell that is converted to electricity.
- 4) What is the effect of ambient temperature and solar insulation on PV cell performance?



for solar isolation, when the solar isolation decreases, the max power that can be generated from the cell decreases. And max power point follows logarithmic locus.

When ambient Temperature increases, max power that can be generated from solar cell decreases. The locus of MPP is a line parallel to voltage axis.

- 5) What's the purpose of the bypass diode in a solar PV system?
- Bypass diodes are connected in parallel with a photovoltaic cell to short the circuit around it. Whereas the blocking diodes are connected in series with the photovoltaic panels to prevent current flowing back into them.