Mock Quiz 1 (All essay type answers should be within 40 words)
ME4252 (25 min)
26 / 08 / 2022

1. Three materials are given below:
   (a) Metal, for e.g., Ag
   (b) Insulator, for e.g., Zirconia
   (c) Semiconductor. For e.g. Si
   Suggest why insulators cannot be chosen for solar cell applications.

2. Consider following position for the trap state responsible SRH recombination.
(a) Within the valance band
(b) Close to the valance band edge
(c) Middle of the band gap
(d) Close to the conduction band edge
   Give one reason why we cannot choose the trap state close to the conduction band edge for efficient SRH recombination.

3. Explain why the intrinsic carrier concentration of Si is 6000 times lesser than those for Ge at 300K.

4. To produce n-type Ge we do extrinsic doping by ---------- valance atoms. Give an example of such a donor/acceptor atom and explain how this doping results in excess electrons.

5. When n-Ge and metal (work function of metal is higher than n-Ge) are brought together to form a junction, we form (i) ---------- contact. (ii) Upon formation of such a contact, the Fermi levels are aligned. Explain the reason.

6. The direction of current due to electrons and holes during diffusion phenomenon in a semiconductor is ---------- (same/opposite), while the direction of current due to electrons and holes during drift phenomenon in a semiconductor is ---------- (same / opposite). Explain the reason for each of your answer above.

7. Define the term work function and electron affinity of a semiconductor.

8. In metal the work function and electron affinity are the same, explain the reason.

9. Imagine Ge being doped by Phosphorus and Boron equally, which is called dual doping.
   (a) What happens to the net charge upon dual doping?
   (b) Explain the reason.

10. In recombination in a direct bandgap semiconductor is also ----------(radiative recombination/non-radiative recombination). This is the working principle for the ---------- (solar cell/light emitting diode) device.