



Course: selected topic(5)
Fourth year

Jan. 2019
Time: 3-Hours

Answer all of the following questions

Question (1)

(20 Marks)

- 1- Sketch the on-grid solar energy system block diagram.
- 2- Explain how can you synchronize the output of the inverter with the grid voltage?
- 3- Design a three phase inverter with the following specs:
 - a- 50 Hz
 - b-220 Output voltage
 - c-48 volt input voltage
 - i- Draw the circuit diagram- base control signals- current wave forms.
 - ii- Draw also the arduino i/o connection.

Question (2)

(20 Marks)

- 1- Explain in details the modified sine wave inverter, draw then the different signals and the corresponding circuits.
- 2- Explain why we perform maximum power point tracking? Illustrate with curves
- 3- Explain Perturb and observe (P&O) algorithm then sketch the MPPT P&O algorithm?

Question (3)

(30 Marks)

Design A solar energy system for the computer education institute in delta region. The institute contains 5 computer class room . each room contains the following equipment with the specs:

	Load	quantity	Power (watt)	Hrs/day	days/week
1	computer	20	100	6	5
2	printer	1	10	2	5
3	Projector	1	200	3	5
4	Internal lamps	10	10	4	5
5	Air condition	1	4000	5	5

The institute has also an additive power which specs are given in the following table:

	Load	quantity	Power (watt)	Hrs/day	days/week
1	Coffee machine	1	1000	3	5
2	furnace	1	1000	2	5
3	Water heater	1	2000	5	5
4	Internal lamps	10	10	4	5
5	External lamps	10	10	10	5

The design should include the number and specs of each of the following:

- a) Solar modules
- b) Charge controller
- c) Inverters
- d) Batteries
- e) Array supports size
- f) Transistor ratings of the Inverter

Good Luck