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15EE832

Eighth Semester B.E. Degree Examination, June/July 2019
Operation and Maintenance of Solar Electric Systems

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define : (i) Insolation   (ii) Irradiation   (iii) Air mass   (06 Marks)
   b. Compare Mono crystalline silicon, Multi crystalline silicon and Thin film solar cells.
                                                                                    (05 Marks)
   c. List and explain the factors which affect the performance of photo voltaic array.   (05 Marks)

OR

2 a. Explain effect of earth's atmosphere on solar radiation.   (05 Marks)
   b. Explain emerging technologies of solar cells.   (06 Marks)
   c. Explain PV cell performance indicators V_{OC}, (open circuit voltage), I_{SC} (short circuit current) and Maximum power point (P_{max}).   (05 Marks)

Module-2

3 a. Compare basic functions of Grid interactive inverters with Battery inverters.   (06 Marks)
   b. Explain different techniques to mount PV arrays on Roof.   (06 Marks)
   c. What is Sun tracking system?   (04 Marks)

OR

4 a. Compare different categories of grid interactive inverters.   (06 Marks)
   b. Explain different ground mounting systems and their applications.   (06 Marks)
   c. Compare Net metering with Gross metering.   (04 Marks)

Module-3

5 a. Explain information to be collected during site assessment for PV system installation.
                                                                                      (06 Marks)
   b. List and explain important factors to be considered when choosing system components.
                                                                                      (05 Marks)
   c. What is de-rating? Explain the factors that cause de-rating.   (05 Marks)

OR

6 a. Explain use of Solar Pathfinder and Horicatcher.   (04 Marks)
   b. What is Fault-Current protection?   (03 Marks)
   c. For a PV system to be installed in Sydney (Ambient temperature varies from 0°C to 50°C), calculate minimum number of modules in a string with the given data:
   Characteristics from module data sheet
   Open circuit voltage (V_{OC}) = 30.2 V   ;   Temperature coefficient of V_{OC} = – 0.104 V/°C
   Maximum power voltage (V_{pm}) = 24 V ;   Temperature coefficient of P_{max} = – 0.485%/°C
   Expected voltage drop across DC cables = 1% ;
   MPP voltage range : 268 V – 480 V;
   Safety margin for minimum inverter input voltage = 10%   (09 Marks)

Module-4

7 a. What are the issues to be taken care during installation of Grid connected PV system.

(08 Marks)

   b. What system documents are to be supplied to the owner after completion PV installation?

(08 Marks)

OR

8 a. Why voltage drop is crucial issue in PV system? Calculate voltage drop if length of cabling route is 15 metres from PV array to inverter. Copper cabling (resistivity is 0.0183 $\Omega/m/mm^2$) is used with across sectional area of 2.5mm^2. It must carry 5 A current. **(08 Marks)**

   b. What are the risks associated with installing PV systems. How the risks are classified.

(08 Marks)

Module-5

9 a. What are the main costs associated with the individual components of the PV system.

(08 Marks)

   b. What are the unique features of PV system among electricity generating technologies that contribute to its popularity. **(08 Marks)**

OR

10 a. What is feed-in tariff? What are the two different ways of FiT(Feed in Tariff). Give important features of feed in Tariffs. **(08 Marks)**

   b. List and explain strong barriers to PV technology. **(08 Marks)**

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