

CBCS SCHEME

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15EE832

Eighth Semester B.E. Degree Examination, November 2020 Operation and Maintenance of Solar Electronic Systems

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

- 1 a. Define the following :
i) Peak Sun Hours (PSH) ii) Irradiation iii) Insolation
iv) Irradiance v) Azimuth angle vi) Altitude angle. (06 Marks)
b. Explain the conventional methods for the production of solar cell. (05 Marks)
c. Explain the characteristics of PV solar cell with suitable graph. (05 Marks)

- 2 a. Write short notes on contacts used in PV modules. (05 Marks)
b. Explain the factors which effect on the performance of PV array. (05 Marks)
c. Design an array with suitable string and module ratings in which the PV array to give the following output ratings: $V_{mp} = 135$ volts; $I_{mp} = 13$ Amps ; $P_{max} = 1755$ Watts. (06 Marks)

Module-2

- 3 a. Briefly explain about main stream Inverter Technologies used in grid interactive PV system. (08 Marks)
b. Describe briefly about the inverter protection system. (08 Marks)

- 4 a. Discuss with sketch the balance of system equipment excluding PV array and Inverter. (08 Marks)
b. Write the classification of PV mounting system and briefly explain the roof mounting system. (08 Marks)

Module-3

- 5 a. Writ the steps involved in Site Assessment. (05 Marks)
b. Compare Portrait and Landscape installation of solar PV array. (06 Marks)
c. Write short notes on 'Site Plan' with example. (05 Marks)

- 6 a. Briefly explain the various protection systems used in PV system. (08 Marks)
b. Calculate the minimum and maximum number of modules in a string for the typical PV array to be installed in Sydney, Australia for the following data :
i) Ambient temperature can vary from 0°C to 50°C (32°F to 122°F)
ii) $V_{oc} = 30.2V$
iii) $V_{mp} = 24V$
iv) Temperature – co-efficient $P_{max} = -0.485\% / ^\circ C$ and $V_{oc} = -0.104V / ^\circ C$
v) Minimum Inverter Input Voltage = 268V
vi) Maximum Inverter Input Voltage = 600V
Assume that DC cable voltage drop 1%, 10% margin to minimum inverter input voltage and 5% margin to maximum inverter input voltage. (08 Marks)

Module-4

- 7 a. With a neat sketch briefly explain Inter connection with the utility grid. (08 Marks)
b. Write short notes on :
i) Cabling routes and required lengths
ii) Safety risks associated with PV installation. (08 Marks)
- 8 a. Explain the PV System – Testing and commissioning procedure as per the national standards. (08 Marks)
b. Briefly explain the solar PV array maintenance. (08 Marks)

Module-5

- 9 a. What are casts associated with the individual components of the PV system? Explain briefly. (08 Marks)
b. Explain briefly about marketing of PV System Installation. (08 Marks)
- 10 With neat block diagram, explain the following case study with PV array configuration and Economics :
Reference : RENAC Renewable Academy
Location : Berlin, Germany, Latitude 53° North
Average annual solar irradiation: 1100 K-Wh/m²/ year in a plane tilted at 30° Oriented south.
The average annual irradiation on a horizontal plane is approximately 950K Wh/m²/ year
Average day time module temperature range: -10°C to 70°C.
Make suitable assumption for missing data. (16 Marks)
