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Eighth Semester B.E. Degree Examination, Aug./Sept. 2020 Operation and Maintenance of Solar Electric Systems

Time: 3 hrs.

Max. Marks: 80

Note: i) *For Regular Students: Answer any FIVE full questions irrespective of modules.*ii) *For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

- 1 a. Define irradiation, diffuse radiation and air mass. (06 Marks)
b. Compare different solar technologies with help of a tabular column. (04 Marks)
c. In an array, 3 PV modules are connected to form a string and 3 such strings are connected in parallel. The rating of string 1 is $V_{mp} = 240V$ and $I_{mp} = 5$ Amps, string 2 is $V_{mp} = 210V$ and $I_{mp} = 6$ Amp and string 3 is $V_{mp} = 180V$ and $I_{mp} = 4$ Amps. Find the total voltage, current and power of the array with diagram. (06 Marks)
- 2 a. Define azimuth angle, solar altitude angle and tilt angle. (06 Marks)
b. What are the standards, certifications and warranties applicable to PV modules? (06 Marks)
c. Explain the I-V characteristics and power-voltage characteristics of PV cells. (04 Marks)

Module-2

- 3 a. What are the basic functions of grid – interactive inverters? (04 Marks)
b. Explain different types of grid – interactive inverters. (06 Marks)
c. Briefly explain the types of roof mounting systems. (06 Marks)
- 4 a. Write short notes on lightning protection and wind loading. (04 Marks)
b. Briefly explain inverter protection systems. (06 Marks)
c. Explain the types of meters used in PV systems. (06 Marks)

Module-3

- 5 a. What are the roof specifications to be considered in site assessment? (04 Marks)
b. When is string fuse protection required? Give examples. (06 Marks)
c. What are the losses in utility – interactive PV systems? (06 Marks)
- 6 a. What are the potential sources of shading? Describe solar path finder. (06 Marks)
b. Write the importance of fault current protection when designing a PV system. (06 Marks)
c. Mention the two voltage specifications need to be met in sizing a PV system with graphical representation. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Explain interconnection of PV array with utility grid using net metering and gross metering arrangements. (08 Marks)
b. Briefly explain the testing of PV systems. (08 Marks)
- 8 a. What are the safety measures in installation of PV systems? (08 Marks)
b. Explain in detail about identifying a fault and troubleshooting PV arrays and inverters. (08 Marks)

Module-5

- 9 a. What are the various costs involved in PV systems? Explain in detail with a curve. (08 Marks)
b. Discuss the general guidelines that should be provided to the owners on completion of PV system installation. (08 Marks)
- 10 a. State the method to calculate upfront costs and simple pay back method. (04 Marks)
b. What are the positive and negative attributes of PV systems need to be considered while marketing? (12 Marks)
