

CBCS SCHEME

18EE731



Seventh Semester B.E. Degree Examination, June/July 2023 Solar and Wind Energy

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. List various Non – Conventional Energy Resources. Give their availability , relative merits and demerits. (08 Marks)
- b. What do you understand by Energy Conservation? Explain its various aspects. (06 Marks)
- c. Explain the terms Energy Management , Energy policy and Energy planning. (06 Marks)

OR

- 2 a. What do you understand by Energy Audit? Explain its types. (08 Marks)
- b. Explain Specifications of Energy Storage devices. (06 Marks)
- c. Define Solar Irradiance , Solar constant , Extraterrestrial and Terrestrial radiations. (06 Marks)

Module-2

- 3 a. Explain the construction and principal of Operation :
i) Pyranometer ii) Sunshine recorder. (10 Marks)
- b. With neat sketch, define the terms :
i) Altitude angle ii) Incident angle iii) Zenith angle iv) Solar Azimuth angle
v) Latitude angle vi) Declination angle vii) Hour angle. (10 Marks)

OR

- 4 a. With neat sketch, explain i) Flat plat collector ii) Concentrating type collector. (06 Marks)
- b. With neat sketch, explain Solar Refrigeration and Air Conditioning. (06 Marks)
- c. With neat sketch, explain Forced Circulation Solar Water Heater. (08 Marks)

Module-3

- 5 a. Enumerates Solar PV Applications. (04 Marks)
- b. Explain the I – V characteristics of a solar cell and define fill factor. What is the significance of fill factor? (08 Marks)
- c. What is the importance of MPPT in a SPV system? Explain various strategies used for operation of an MPPT. (08 Marks)

OR

- 6 a. Explain how the variation of insolation and temperature affects the I – V characteristics of a solar cell. (06 Marks)
- b. A PV system feeds a dc motor to produce 1 hp power at the shaft. The motor efficiency is 85%. Each module has 36 multicrystalline silicon solar cell arranged in 9×4 matrix. The cell size is $125\text{mm} \times 125\text{mm}$ and cell efficiency is 12%. Calculate the number of modules required in the PV array. Assume global radiation incident normally to the panel as 1kW/m^2 . (07 Marks)

- c. A PV source having IV characteristics as shown in Fig. Q6(c) is supplying power to a load whose load line intersects the characteristics at (10V, 8A). Determine the additional power gained if an MPPT is interposed between the source and the load. If the cost of the MPPT is Rs 4000.00, for how long the system needs to operate in order to recover the cost of MPPT. The cost of electricity may be assumed as Rs 7.00 per KWh. The efficiency of MPPT may be assumed as 95%. (07 Marks)

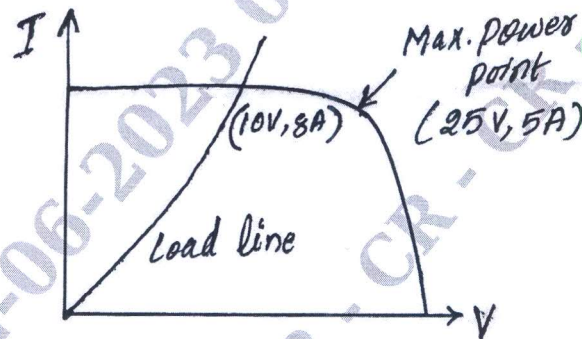


Fig. Q6(c) PV System – Load characteristics.

Module-4

- 7 a. Write a brief note on the following :
 i) Nature of the WIND ii) Wind Data. (10 Marks)
 b. Briefly explain Wind Energy site selection considerations. (10 Marks)

OR

- 8 a. Explain the following :
 i) Wind Energy Scenario – World and India ii) Power in the Wind. (10 Marks)
 b. What are the Environmental benefits and problems of Wind Energy? (10 Marks)

Module-5

- 9 a. with neat sketch, explain Horizontal Axis Wind Turbine (HAWT). (10 Marks)
 b. With general block diagram, explain Wind Energy Conversion System (WECS). (10 Marks)

OR

- 10 a. Write a brief note on the following :
 i) Wind Energy Storage ii) Environmental Aspects. (10 Marks)
 b. An Aero – generator generates an output of 1200W at wind speed of 5m/s at one atmospheric pressure and a temperature of 20°C. What will be the output. If the same Aero – generator is installed on the top of a hill where the temperature is 10°C, pressure is 0.85 atmospheric and wind speed is 6m/s. (10 Marks)
