Roll No. [redacted] Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CE / CSE / ECE / CIVIL) (Sem.–6)

WIND AND SOLAR ENERGY SYSTEMS

Subject Code : OEE-203-18

M.Code : 79324

Date of Examination : 25-05-2023

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. **Write briefly :**

a) What are the advantages of wind power?

b) Explain what is meant by tip speed ratio?

c) Define Solidity in rotor design of wind system.

d) Why horizontal axis wind turbines are preferred over vertical axis wind turbines?

e) Classify different wind turbine rotors.

f) Define altitude angle and Azimuth angle.

g) What is beam radiation? How solar radiation is measured?

h) What is solar thermal energy collector?

i) What is MPPT is solar energy conversion system?

j) Explain principle of sunshine recorder.

SECTION-B

2. With the help of neat sketch, discuss the different types of rotors used in wind turbines.

3. Wind at one standard atmospheric pressure and 15°C has a speed of 10 m/s. A 10-m diameter wind turbine is operating at 5 rpm with maximum efficiency of 40%. Calculate
   a) the total power density in wind stream,
   b) The maximum power density
   c) The actual power density
   d) The power output of the turbine
   e) The axial thrust on the turbine structure

4. Define the following terms and differentiate between their meanings
   a) Beam radiation and diffuse radiation
   b) Surface azimuth angle and solar azimuth angle

5. With the help of suitable circuitry discuss impact of shading on a PV module with 'n' cells. Derive the expression of drop in voltage (ΔV) at any given current 'I' in case of shading of one cell in an n-cell module. Also plot the I-V curve with full sun and one cell shaded.

6. Explain the operation of hybrid solar PV and wind power system.

SECTION-C

7. Discuss various steps in designing of grid integrated wind energy conversion system using doubly fed induction generator.

8. What are various types of solar thermal power generation techniques? Explain any two in detail.

9. Explain the different types of solar cells on the basis of material thickness and the type of junction structure. Discuss the reason for low efficiency of solar cells.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.