

7. (a) Write short notes on any *two* of the following : **10**

- (i) Fresnel
- (ii) Parabolic troughs
- (iii) Doubly fed induction generator
- (iv) Differentiate between surface azimuth angle and solar azimuth angle

(b) Discuss the power quality issues in the integrated system of wind farms and PV parks with grid. **5**

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Total Pages : 04

**007606**

**May 2024**

**B. Tech. (EL/ME) (Sixth Semester)**

**Wind and Solar Energy System**

**(ELPE-614)**

**Time : 3 Hours]**

**[Maximum Marks : 75**

**Note :** It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

**Part A**

1. (a) Write down the working principle of pyranometer. **1.5**
- (b) What are the reasons for variation in the amount of solar energy reaching earth surface ? **1.5**
- (c) Define tip speed ratio. **1.5**
- (d) Write down the advantages of wind energy system. **1.5**
- (e) Describe the wind power generation curve. **1.5**

- (f) Differentiate between stall and pitch control. **1.5**
- (g) Write down the working of central tower receiver using heliostat mirrors. **1.5**
- (h) Determine the solar insolation on March 22 assuming the solar constant  $I_{sc} = 1353 \text{ W/m}^2$ . **1.5**
- (i) What is the major difference between monocrystalline and polycrystalline technologies? **1.5**
- (j) Draw the graph showing variation of power coefficient with tip speed ratio for different rotors. **1.5**

### Part B

2. (a) Describe in detail about the PV module equivalent circuit and its I-V characteristics. **10**
- (b) Explain the working of Darrieus type vertical turbine. **5**
3. (a) Find the angle subtended by beam radiation with the normal to a flat plate collector at 9 a.m for the day on November 2, 2003. The collector is in Delhi ( $28^{\circ}35'N$ ,  $77^{\circ}12'E$ ), inclined at an angle of  $36^{\circ}$  with the horizontal and is facing due south. **5**

- (b) Explain in detail about the various MPPT controllers along with Perturb and Observe based MPPT algorithm in the PV System. **10**
4. (a) Derive an expression for energy that can be extracted from wind. Also obtain the value of coefficient of performance for maximum power. **5**
- (b) Discuss the power electronic convertors used in wind energy conversion. Also explain the convertor control for the same. **10**
5. (a) Write a note on solar radiation spectrum. **5**
- (b) A WEG generates 1500 watts at rated speed of 24 kmph at the atmospheric pressure and temperature at  $20^{\circ}C$ . Calculate the change in output if the wind generator is operated at an altitude of 1800 m, temperature  $10^{\circ}C$ , wind speed 30 kmph and air pressure 0.88 atmosphere. **10**
6. (a) Explain the working of grid tied WECS with neat diagram. **10**
- (b) Write a note on grid code technical requirements for network Integration of Renewables sources with Grid. **5**