

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**

Roll No.

Total Pages : 04

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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° 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