ECE 333 Green Electric Energy

Fall 2017
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Homework 4

The solutions will be released on Monday, October 16, 2017

Quiz Date: Thursday, October 19, 2017 during class

The quiz is based on the following material: Lecture 9, Chapter 7 (Sections 7.5, 7.6, 7.7.1, 7.7.2 and 7.8) from the textbook and the problems in Homework 4.

Problem 1: 7.6 and 7.7 from the textbook.

Problem 2:

a. **Sketch** the ideal power curve of the turbine with the following characteristics:

- rated speed is 14 *m/s*
- cut-in speed is 5 *m/s*
- rated power is 1.25 *MW*
- furling or cut-out speed is 20 *m/s*

b. **Given** part (*i*), calculate the energy produced in one day if the wind blows continuously between 15 and 20 *m/s* all day

c. Can the energy produced in one year be determined if you are told that the average wind speed is 14 *m/s*? Explain why.

Problem 3:

Consider an anemometer mounted at a height of 10 *m* with a 20-*m/s* average wind speed

a. **Estimate** the average wind power at a height of 10 *m*, assuming Rayleigh statistics and under the following weather conditions

- $15^{o}C$
- $-5^{o}C$

b. Suppose a 1300-kW wind turbine with 60-m rotor diameter is located in those winds with speed computed in the first condition of part (a). **Determine** the annual energy production with a 30% wind turbine efficiency