ECE 333 Green Electric Energy Quiz 2 *Thursday, October* 5, 2017

Closed book, closed notes, cell phones are not allowed.

Show all you work and always indicate the units, as appropriate.

Duration: 15 minutes

Name: _____ last 4 digits of your UIN: _____

Problem 1: [100 points]

Find the amount of wind energy at 15 °C and 1 *atm* pressure that passes through 1 m^2 of cross-sectional area for the following wind regimes:

(Take the air density at 15 °C and 1 *atm* pressure as 1.225 kg/m^3).

(*i*) **[50 points]** 100 *hours* of 6-*m/s* winds

With 100 h at 6 m/s

Energy (6 m/s)=

$$\frac{1}{2}\rho Av^{3}\Delta t = \frac{1}{2} \left(1.225 \frac{kg}{m^{3}} \right) (1 \ m^{2}) (6 \ m/s)^{3} (100h) = 13,230 \ Wh$$

(*ii*) **[50 points]** 50 hours at 3 m/s plus 50 hours at 9 m/s (i.e. an average wind speed of 6 m/s)

With 50 h at 3 m/s Energy $(3 \text{ m/s}) = \frac{1}{2}\rho Av^3 \Delta t = \frac{1}{2}(1.225 \text{ }kg/m^3)(1 \text{ }m^2)(3 \text{ }m/s)^3(50 \text{ }h) = 827 \text{ }Wh$ With 50 h at 9 m/s Energy $(9 \text{ }m/s) = \frac{1}{2}\rho Av^3 \Delta t = \frac{1}{2}(1.225 \text{ }kg/m^3)(1 \text{ }m^2)(9 \text{ }m/s)^3(50 \text{ }h) = 22,326 \text{ }Wh$ For a total of 827 + 22,326 = 23,153 Wh