Menofiya University
Faculty of Engineering
Dept of Electrical Engineering .
Date: 3 /6/2014
Total Marks: 70
Subject/Code: New and renewable energy / **ELE 321A**

Final Term Exam
Academic Year: 2012-2013
3rd Year
Allowed Time: 3 Hours

This exam measures ILO's no. (A3, A8, B2, C13, D3)
Remarks: No. of pages: 2 No. of questions: 4
Allowed Tables and Charts: (None)

Answer All The Following Questions:

The First Question (15- Marks)

a) Explore the advantages and disadvantages of renewable energy sources.
b) With the aid of a block diagram, explain how bio-ethanol is created by fermenting biomass.
c) What is the advantages and disadvantages of the Geothermal energy.

The Second Question (15- Marks)

a) List the types of Photovoltaic System. Then, explain the PV array characteristics.
b) Compare between the four techniques of solar thermal power plants.
c) The average daily solar radiation received on a PV array through the winter and summer seasons are computed and given as 0.474, 0.536 (kw/m2) at an Egyptian site. If this system is used to supply a lighting load have an average power of 0.3 Kw through the year at the considered site, find the global PV array size and the capacity of the storage battery required. Assume the efficiencies of PV array, power conditioner and storage battery as 10% , 87% and 85% respectively. And the charge –discharge cycle of the storage battery is one week, assuming the average yearly operation hours of the lighting load is 10 hours per day.

The Third Question (20- Marks)

a) Draw the wind power plant diagram.
b) Drive the mathematical expression of the wind power. Then, draw the power flow diagram of WES.
c) A Sandia 17 m Darrieus wind turbine is located at a site with weibull parameters c=7 m/s and k=2.6. Which configuration produces more energy each year, the 42 r.p.m generator rated at 25 Kw in 11 m/s wind speed or the 52.5 r.p.m generator rated at 60 Kw in 15.5 m/s wind speed ?Assume that v_{ci}= 5 and 6.5 m/s for 25 and 60 Kw wind generator respectively, take v_{co}= 20 m/s for both generators

Where;
$$C.F = \frac{e^{-(\frac{v_{ci}}{c})^k} - e^{-(\frac{v_r}{c})^k}}{(\frac{v_r}{c})^k - (\frac{v_{ci}}{c})^k} - e^{-(\frac{v_{co}}{c})^k}$$

The Fourth Question (20- Marks)

a) Compare between the horizontal and vertical axis turbines.
b) Explain the relation curve of wind speed versus output electrical energy
c) The Weibull distribution function at a given site have the following parameters; C= 6 m/s and K=1.8. Estimate the number of hours per year that wind speed will be between 6.5 m/s and 7.5 m/s. Estimate also, the number of hours per year that wind speed will be greater than or equal to the cut-out wind speed of a wind generator of 15 m/s .

If the probability density function, f(V), is given by:

$$f(v) = \left(\frac{K}{C}\right)\left(\frac{V}{C}\right)^{K-1} EXP\left[-\left(\frac{V}{C}\right)^{K}\right]$$

With best wishes
Dr. Hala. S. Elsayed