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Total Number of Pages : 02

M.TECH

M.TECH 1<sup>ST</sup> SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017

SMART ELECTRICAL ENERGY SYSTEM

Branch: PE, Subject Code:MPEPC1010

Time: 3 Hours

Max Marks : 70

The figures in the right hand margin indicate marks.

**PART-A****( 10X 2=20 MARKS)****1. Answer the following questions.**

- Draw the power - speed and torque - speed characteristics of wind turbines
- What will be the power generation in a 100kW wind turbine?
- How reactive power can be compensated in wind energy system
- Calculate the fill factor for a solar cell which has the following parameters:  
 $V_{oc}=0.24$  V,  $I_{sc}=-9$  mA,  $V_{max}=0.14$  V,  $I_{max}=-3$  mA
- How photovoltaic (PV) modules are rated and what is the efficiency of commercial solar cell?
- A generating station has connected load of 450 MW and a maximum demand of 250 MW, units generated being  $615 \times 10^6$  per annum. Calculate the demand factor and load factor
- What are the operating modes of DG
- What are the types of converters used for Wind energy systems
- Difference between smart grid and micro-grid.
- What are major functions of Smart Grid

**PART-B****(5 X 10=50 MARKS)****Answer any five questions from the following.**

- For an 8 – blade wind turbine, calculate the angular speed of the rotor to **lift** water from 6-m depth if the radius of the turbine rotor is 1m and the wind speed is 10 m/s. Assume  $\lambda=1$
  - A HAWT has the following data:  
Speed of wind = 10 m/s at 1 atm and 15<sup>0</sup>C  
Diameter of rotor = 120 m  
Speed of rotor = 40 rpm  
Calculate the maximum possible torque produced at the shaft
- Explain with a neat diagram the working of various types of wind generators
  - Explain the role of charge controller in PV system

4. a. Explain how Smart Appliances can be the part of Smart Grid.  
b. What is grid interfacing and how can the grid connection be made possible
5. a. Why solar collector are used. Write and explain the various characteristics of solar collector  
b. Show that a wavelength of  $\lambda = 1 \mu\text{m}$  solar radiation corresponds to an energy of 1.24 eV. Give all assumptions made
6. a. State and explain various DG technologies  
b. Discuss in brief about Distribution automation and control
7. a. Draw and explain the block diagram of Static VAR generator employing an inverter  
b. Explain the fixed speed system of wind system with Squirrel Cage Induction Generator
8. a. Explain the solar Collector Characteristics;  
b. Explain the application of solar energy to space heating

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