

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester - VI  
**TE201A - Wind and Solar Energy System**

P. Pages : 2

Time : Three Hours



**GUG/S/23/13870**

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Use of slide rule, Logarithmic Tables, Steam Tables, Mollier's Chart, Drawing Instrument, Thermodynamic tables for moist air, Psychometric Charts and Refrigeration charts is permitted.
  6. Answer **five** questions.

1. a) The area and the tip speed of the turbines rotor and turbine blade is  $1000 \text{ m}^2$  and  $9 \text{ m/s}$  respectively. The air density available in the area is  $660 \text{ kg/m}^3$ . If the power available in the wind is  $12000 \text{ W}$  then what could be the tip speed ratio. **4**  
  
b) A wind mill is located in the area where the velocity of the wind is  $50 \text{ m/s}$ . the air density available is  $1200 \text{ gm/m}^3$ . If the area of wind turbine is  $400 \text{ m}^2$ , then find the maximum power that can be extracted from the wind. **4**  
  
c) Write short note on history of wind power. State the advantages and disadvantages of wind energy. **8**

**OR**

2. a) Explain stall control and pitch control in detail. **8**  
  
b) The maximum power that can be extracted from a particular wind mill is  $15,000 \text{ W}$ . If the area of the turbine rotor is  $1800 \text{ m}^2$  and the available air density is  $600 \text{ kg/m}^3$ . Find the speed of the wind available in the area. **4**  
  
c) Explain the wind physics in detail. **4**
3. a) Explain power electronics converter. **4**  
  
b) State the benefits and limitations of variable-speed wind turbines. **4**  
  
c) Explain the synchronous generators with advantages and limitations. **8**

**OR**

4. a) Classify the types of generators used in wind turbines and variable-speed wind turbines. **8**  
  
b) Explain Permanent Magnet Synchronous Generator (PMSG). **8**
5. a) Explain summer solstice and winter solstice. **8**  
  
b) Define extra-terrestrial and terrestrial radiation. **4**

- c) With a neat sketch define solar angles. 4

**OR**

6. a) Explain the mechanism of photoconduction in solar PV cell. 4
- b) Explain: 4
- a) Solar cell, b) Solar PV module,
- c) Solar panel, d) Solar array.
- c) Explain Multicrystalline solar cell. Also state the difference between monocrystalline and multicrystalline cell. 8
7. a) What are the problems associated with interconnected power system? 8
- b) Why are hybrid energy-based system needed? 4
- c) What is the voltage sag and what are the characteristics of that? 4

**OR**

8. a) Explain grid code technical requirements in detail. 8
- b) What are the issues associated with the integration of renewable energy resources? 8
9. a) Write short note on: 8
- a) Box type solar cooker,
- b) Dish type solar cooker,
- c) Community solar cooker
- b) Explain construction and working of solar panel electric power plant. 8

**OR**

10. a) Explain aqua-ammonia absorption system. 8
- b) Explain construction and working of flat plate collector with neat sketch. 8

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