Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 64034

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Elective

Power Systems Engineering

PS 7007 — WIND ENERGY CONVERSION SYSTEMS

(Common to M.E. Power Electronics and Drives and M.E. Electrical Drives and Embedded Control)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the components of WECS.

2. List out various WECS schemes.

3. Define thrust in HAWT.

4. State the efficiency of VAWT.

5. List the factors to be considered for the design of generator model for steady state analysis.

6. What is drive train model?

7. Draw wind speed characteristics.

8. Draw block diagram of DFIG variable speed motor.

9. Define LVRT capability of wind turbine.

10. What are the modeling issues in industry wind interconnection system?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Obtain expression for power from the wind in the case of horizontal axis –propeller-type wind mill. (8)

(ii) Explain Sabinin's theory. (8)

Or

(b) (i) Derive the expression for forces on the blades of propeller type wind turbine. (8)

(ii) Describe the simple momentum theory. (8)

12. (a) (i) Obtain the expression for maximum power in the case of HAWT. (8)

(ii) Design various aspects of rotor for VAWT. (8)

Or

(b) (i) Design rotor of HAWT considering Tip speed ratio, number of blades, blade profile. (8)

(ii) Describe the analysis of Yaw control, pitch angle control and stall control in the case of HAWT. (8)

13. (a) (i) Explain the deciding factor in synchronous generator to get constant speed constant frequency in wind energy system. (4)

(ii) With example design fixed speed induction generator model for transient stability analysis. (12)

Or

(b) (i) With example describe model of wind speed and wind turbine rotor. (8)

(ii) Explain squirrel cage induction generator model for fixed speed system. (8)

14. (a) Explain the decoupled control of DFIG wind turbine with rotor side and grid side controller modelling. (16)

Or

(b) Describe PMSG wind turbine model with schematic diagram and relavent equations. (16)

15. (a) Design Grid connected wind system based on wind interconnection grid code requirements. (16)

Or

(b) With example describe industry trends wind interconnection on steady state performance of the power system. (16)

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