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Question Paper Code : 13918

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

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)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the significance of power coefficient.
2. Define momentum.
3. Write the expression for tip speed ratio with various parameters.
4. Write the significance of pitch angle control.
5. List out the merits of DFIG.
6. Write the importance of dynamic stability.
7. Write the advantages of variable speed drives.
8. What are the types of wind turbine blades?
9. Define ramp rate.
10. Name the wind potential rich areas in India.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the structure of the wind energy conversion system with neat diagram. (8)
(ii) Explain the fundamentals of various WECS schemes. (8)

Or

- (b) (i) Illustrate the significance of momentum theory. (8)
(ii) Briefly describe the concept of aerodynamics of wind turbine. (8)

12. (a) Discuss in detail the designing procedure of wind turbine with sample example. (16)

Or

- (b) Write a technical note on the following :
(i) Wind turbine rotor design.
(ii) Maximum power extraction. (8 + 8)

13. (a) With neat block diagram, explain the principles of constant speed constant frequency generating systems. (16)

Or

- (b) Explain the modelling of
(i) Drive train.
(ii) Transient stability based wind generator. (8 + 8)

14. (a) (i) Explain the necessity of variable wind speed systems. (8)
(ii) With neat illustration, explain the features of power-wind speed characteristics. (8)

Or

- (b) (i) Explain the operating principle of DFIG. (8)
(ii) Demonstrate the concept of variable speed variable frequency schemes. (8)

15. (a) (i) Explain the various requirements of wind turbine interconnected to the power grid. (8)
(ii) Describe the importance of wind turbine interconnection during the dynamic state of the power system. (8)

Or

- (b) Briefly describe the role of wind generation used as ancillary services to maintain the frequency and voltage of the grid. Comment on the ancillary service payment for the above service. (16)