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Question Paper Code : 17971

M.E. DEGREE EXAMINATION, NOVEMBER/ DECEMBER 2016.

Third Semester

Electrical Drives and Embedded Control

PX 7301 — POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

(Common to M.E. Energy Engineering / M.E. Power Electronics and Drives and Powers Systems Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the major factors influencing the amount of GHG emissions.

2. What is SOFC? State its Limitations.

3. Draw the equivalent circuit model of a PMSG.

4. Why are induction generators preferred over DC generators in WECS?

5. What are the factors to be considered for the selection of batteries for solar energy conversion system?

6. What is a grid interactive inverter? State its significance.

7. What are the issues in connecting the renewable energy systems to the grid?

8. Differentiate between fixed and variable speed wind energy conversion systems.

9. What is the necessity of Maximum power point tracking in PV system?

10. What are the advantages of PV-Diesel hybrid system?

PART B — (5 × 13 = 65 marks)

11. (a) What are the different types of fuel cells? Explain them with neat diagrams.

Or

(b) Discuss the influence of different renewable energy sources with special reference to the global warming and climate change context.

12. (a) Draw the schematic of Double Fed Induction Generator and explain its construction and principle of operation in detail. Discuss its characteristics and limitations briefly.

Or

(b) Explain about PMSG based wind energy conversion system in detail. Also discuss its advantages and operating issues.

13. (a) A single phase fully controlled converter is used for obtaining a regulated D.C output voltage. The RMS value of the A.C input voltage is 230 V, and the firing angle is maintained at 60° so that the load current is 4A.

(i) Calculate D.C output voltage and active and reactive power input.

(ii) Calculate the above quantities if a free wheeling diode is used at the output. The firing angle is maintained at 60° assuming the same load with resistance.

Or

(b) (i) Explain the space vector PWM technique to control 3-phase inverter with neat schematic diagrams. (8)

(ii) Draw and discuss the operation of a Matrix converter. (5)

14. (a) Draw and discuss the operation of grid integrated PMSG system with a neat block diagram. Also discuss its limitation with regard to implementation and operation.

Or

(b) Discuss in detail the grid system characteristics and explain with a neat diagram the stand alone and grid integrated solar system.

15. (a) Enlighten the need and advantages of hybrid renewable energy systems. Also explain the operation of Wind-PV hybrid system with neat diagrams in detail.

Or

(b) Explain the incremental-conductance based maximum power point tracking algorithm with a suitable illustration.

PART C — (1 × 15 = 15 marks)

16. (a) Design and implement a suitable converter for a 20 kW wind turbine generator. The converter should consists of a phase controlled rectifier and a DC/DC boost converter. Assume suitable data and components necessary for design and implementation.

Or

(b) Design a converter to interface a PV module to the grid and extract the maximum power from it.

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