

21/4/17 (F2)

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Question Paper Code : 71758

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Eighth Semester

Electrical and Electronics Engineering

EE 6009 — POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give any two environmental aspects of electric energy conversion.
2. Justify how fuel cell becomes renewable energy source.
3. Name any four types of generators used in wind energy conversion systems.
4. Write the significance of reference theory.
5. What is the function of boost converter in solar photovoltaic system?
6. What is called matrix converter?
7. Distinguish between fixed speed and variable speed wind energy conversion system.
8. What are the major problems associated with grid integration of wind energy system?
9. What are the advantages of hybrid renewable energy systems?
10. What is the importance of Maximum Power Point Tracking (MPPT) in the operation of a photovoltaic system?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the impact of renewable energy based power generation on environmental issues. (8)
(ii) What is Hydrogen energy? Explain the operation of Hydrogen energy system with schematic diagram. (8)

Or

- (b) List out the available renewable energy sources. Explain how solar and wind energy sources plays significant role of electric power generation. (16)

12. (a) Draw the equivalent circuit and show the steady state analysis of Permanent Magnet Synchronous Generator (PMSG). Explain the merits and demerits of PMSG for wind energy conversion system. (16)

Or

- (b) (i) Explain the operating principle of Squirrel Cage Induction Generator coupled with wind turbine. (8)
- (ii) Show the relative merits of wind energy conversion system with Permanent Magnet Synchronous Generator (PMSG), Squirrel Cage Induction Generator (SCIG), and Doubly Fed Induction Generator (DFIG). (8)
13. (a) Draw the schematic diagram of standalone solar photovoltaic system. What are the main components used in it? Explain their functions. (16)

Or

- (b) (i) Draw the power circuit of grid interactive inverter and explain its operation. (8)
- (ii) Explain the need of AC-DC-AC converters for wind energy conversion system. (8)
14. (a) Draw the general structure of variable speed wind energy conversion for standalone system. Explain the functions of components used. Mention the merits and demerits of variable speed wind energy conversion. (16)

Or

- (b) What is the need for grid integration of wind energy system? With power electronic interface circuit, explain how grid integration is done for Permanent Magnet Synchronous Generator (PMSG) based wind energy conversion system. (16)
15. (a) Show the power electronic system used for hybrid solar photovoltaic and wind energy system and explain its operation. Discuss the technical challenges associated in it. (16)

Or

- (b) What is called Maximum Power Point Tracking (MPPT)? List out the different types of MPPT algorithms used for solar photovoltaic system with its salient features. Explain the use of MPPT for hybrid wind and photovoltaic energy system. (16)