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Question Paper Code : 20949

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fifth Semester

Electrical and Electronics Engineering

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EE 3014 — POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the limitations of renewable energy sources?
2. What are the different forms of biomass available as biofuels?
3. What is the principle of wind energy conversion system?
4. Compare conventional synchronous machine and PMSG.
5. Write down the basic principle of the buck-boost converter.
6. What are PV Modules and Arrays in Solar PV systems?
7. What is meant by power converter in wind turbine?
8. Enlist the merits of matrix inverters.
9. Name any four hybrid systems.
10. Define Maximum Power Point Tracking (MPPT).

PART B — (5 × 13 = 65 marks)

11. (a) Summarize about the various types of non-conventional energy source with a suitable example.

Or

- (b) Define Fuel cells. Explain the operating principles and characteristics of Fuel cells with a neat sketch.

12. (a) Discuss the principle of operation and analysis of Squirrel Cage Induction Generator (SCIG).

Or

- (b) Briefly explain the different modes of operation of DFIG with necessary power flow diagrams.

13. (a) Explain with the help of block diagrams, the operations of stand-alone and grid interactive solar PV systems.

Or

- (b) Discuss the factors to be considered for the selection of inverter, battery sizing and array sizing of solar PV systems.

14. (a) Draw the schematic diagram and also explain the working principle of three-phase AC voltage controllers with its applications.

Or

- (b) Explain PWM Inverters with a suitable sketch and also discuss its merits and demerits.

15. (a) Define hybrid energy systems. What is the need for hybrid systems and also explain any one of the hybrid systems with a neat sketch?

Or

- (b) Explain with a case study of installed hybrid energy systems in your city or state.

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the various methods of production of hydrogen for use as an energy carrier. What are the various methods of hydrogen storage?

Or

- (b) Explain in detail with the help of a suitable diagram the principle of operation of PMSG in a variable-speed wind energy conversion scheme.