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**Question Paper Code : 70459**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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. Write down the current equation of solar array.
2. Define specific rated capacity of wind turbine.
3. Draw the speed-torque curve of induction generator.
4. Explain briefly, the rotor construction of DFIG.
5. What is the function of boost converter in solar photovoltaic system?
6. What is called matrix converter?
7. Define pitch control in wind power system.
8. List out the functions of a charge controller in PV system.
9. What is the need for hybrid systems?
10. Draw the PV characteristics of solar PV system and mark the maximum point.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the impact of renewable energy based power generation on environmental issues. (7)  
(ii) What is Hydrogen energy? Explain the operation of Hydrogen energy system with schematic diagram. (6)

Or

- (b) List out the available renewable energy sources. Explain how solar and wind energy sources plays significant role of electric power generation. (13)

12. (a) Explain doubly fed induction generator with neat sketch. (13)

Or

- (b) Discuss in detail about the construction and working of permanent magnet synchronous generator. (13)

13. (a) Explain the operation and control of matrix converter with its circuit diagram and switching condition. (13)

Or

- (b) Explain the operation of following converters : (13)

(i) Three phase AC voltage controller

(ii) PWM inverter.

14. (a) Explain the operation of fixed speed and semi variable mode of wind energy conversion system with neat sketch. (13)

Or

- (b) Explain the circuit model of grid integrated solar system. (13)

15. (a) What is a hybrid system? Mention the need for hybrid system. Also explain in detail about the series hybrid system with necessary diagrams in detail.

Or

- (b) List the different types of MPPT algorithm. Explain the Incremental conductance MPPT algorithm with a neat flow chart.

PART C — (1 × 15 = 15 marks)

16. (a) A three phase diode bridge is supplied by a synchronous generator whose excitation emf is 1.06 p.u. and synchronous reactance is 0.25 p.u. Assuming continuous load current of 0.8 p.u. Determine the percentage of the dc output voltage of its no-load voltage and the total rating of the rectifier. Neglect diode drops.

Or

- (b) A horizontal axis wind turbine has a diameter of 6 m. When the wind speed unaffected by the turbine is 10 m/s, the turbine rotates at 300 rpm and produces 5 kw of mechanical power. Find the tip speed ratio and the power coefficient.
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