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Question Paper Code : X 20472

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Eighth Semester
Electrical and Electronics Engineering
EE6009 – POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What are the advantages of using grid-connected solar PV system ?
2. Define Betz limit.
3. Write the advantages of wound rotor induction generator used in wind power generation.
4. Mention few permanent magnet materials used in designing PMSGs.
5. Draw the circuit diagram of buck-boost dc-dc converter.
6. What are the factors involved in battery sizing ?
7. Draw the output characteristics of wind turbine and lable all the speed ranges.
8. Mention different types of energy storage used in renewable energy system.
9. Define fill factor (FF) of solar cell.
10. What are the advantages of using hybrid energy system ?

PART – B **(5×13=65 Marks)**

11. a) i) With the neat diagram explain the working principle of Fuel cell. **(7)**

ii) Describe the concept of power generation using biomass. **(6)**

(OR)

b) Discuss the impact of following renewable energy sources on environment.

i) Wave energy

ii) Wind energy **(6+7)**

12. a) Discuss in details about the construction and working principle of Permanent Magnet Synchronous Generator (PMSG) with neat sketch.

(OR)

b) Explain the steady state equivalent circuit model and performance characteristics of Squirrel Cage Induction Generator (SCIG) in detail.

13. a) Discuss the control strategy used in grid-interactive power converter system with neat diagram.

(OR)

b) Describe any two power conditioning schemes using in solar PV system in detail.

14. a) Draw the schematic diagram of standalone operation of Solar PV system. What are the main components used in it ? Explain their functionalities. **(3+5+5)**

(OR)

b) What is the need of grid integration of wind energy conversion system ? With power electronic interface circuit, explain how grid integration is done for Doubly-Fed Induction Generator (DFIG) based wind energy conversion system.

15. a) Explain any three different configuration of hybrid renewable energy system in detail.

(OR)

b) List the different types of MPPT algorithm used in solar PV system. Explain Perturb and Observe (P&O) algorithm based MPPT of such system with flow chart.

PART – C **(1×15=15 Marks)**

16. a) i) 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. **(10)**

ii) Derive an expression of power extracted from the wind turbine. **(5)**

(OR)

b) Write short notes on the following :

i) Current regulated PWM inverters. **(5)**

ii) Selection of inverters. **(5)**

iii) Matrix converters. **(5)**