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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)



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Question Paper Code : 40985

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B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

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. What are the advantages of using grid connected solar PV system ?
2. Mention the factors involved in biomass conversion.
3. Draw the angular relationship of abc and dq winding in an induction generator.
4. What are the advantages of permanent magnet synchronous generator ?
5. Draw the block diagram of solar photovoltaic system.
6. What are the factors involved in battery sizing ?
7. What are the classifications in wind energy conversion system based on electrical power output ?
8. List out the problems involved in grid connection.
9. What is the need for hybrid systems ?
10. Draw the PV characteristics of solar PV system and mark the maximum point.

PART – B

(5×16=80 Marks)

11. a) Briefly explain the working principle of fuel cell. (16)
- (OR)
- b) Discuss the impact of following renewable energy generation on environment. (16)
 - i) ocean energy
 - ii) wind energy system.

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12. a) Explain doubly fed induction generator with neat sketch. (16)
(OR)
b) Discuss in detail about the construction and working of permanent magnet synchronous generator. (16)
13. a) Explain with a neat diagram, a power electronic circuit to interface wind electrical system to the grid. (16)
(OR)
b) Discuss the control strategy used in grid interactive inverters. (16)
14. a) Briefly explain the grid integrated SCIG based wind energy conversion system. (16)
(OR)
b) Write a detailed note on standalone operation of photovoltaic system. (16)
15. a) Explain briefly about switched configuration of Diesel-PV hybrid system. (16)
(OR)
b) Explain the following methods of MPPT control algorithm. (16)
i) Incremental conductance method
ii) Fuzzy logic controller.

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Question Paper Code : 52939



B.E. B.Tech. DEGREE EXAMINATION, APRIL/MAY 2019.

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. State the merits of renewable energy sources.
2. Mention some of the organic materials used in bio-mass plant.
3. Write the advantages of doubly fed Induction generators used in WECS.
4. What is the basic principle of wind energy conversion?
5. Draw the basic block diagram of wind energy conversion system.
6. What is grid interactive inverter?
7. Define pitch control in wind power system.
8. List out the functions of a charge controller in PV system.
9. List the different types of hybrid system.
10. What is MPPT in PV system?

PART B — (5 × 13 = 65 marks)

11. (a) What is a fuel cell? Mention the different types of fuel cell and explain any three them in detail with neat diagrams.

Or

- (b) Explain the operating principle of any four types of renewable energy sources.

12. (a) Draw the equivalent circuit and obtain the steady-state analysis of Induction Generator.

Or

- (b) Explain the construction and principle of operation of Double fed Induction Generator in detail with neat diagram. Also discuss its characteristics and limitations briefly.

13. (a) Describe any two power conditioning schemes used in photovoltaic systems.

Or

- (b) What is a matrix converter? Explain it in detail. Also briefly state its advantages and limitations.

14. (a) (i) Explain the stand-alone operation of fixed speed wind energy conversion system with neat diagram. (10)

- (ii) Discuss the factors that affect the output of a PV system. (6)

Or

- (b) Explain in detail about the grid integrated permanent magnet synchronous generator in detail with relevant diagram and also discuss the issues of grid connection in detail.

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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Question Paper Code : 50467

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 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. Write down the current equation of solar array.
2. Define specific rated capacity of wind turbine.
3. What is reference frame transformation ?
4. Compare SCIG and DFIG.
5. Draw the block diagram of solar photovoltaic system.
6. What are the advantages of matrix converter ?
7. What are the advantages of variable speed wind turbine conversion system ?
8. Draw the equivalent circuit of a non salient pole synchronous machine.
9. List out the need for hybrid renewable energy system.
10. What is the concept of MPPT ?

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PART – B

(5×16=80 Marks)

11. a) Explain the construction, working and different characteristics of solar array in detail. (16)
- (OR)
- b) i) With the neat diagram explain the energy generation using hydrogen energy system. (8)
- ii) Describe the concept of electric power generation from Biomass. (8)
12. a) Explain the steady state equivalent circuit model and performance characteristics of squirrel cage induction generator in detail. (16)
- (OR)
- b) Explain the construction and working of PMSG and analyze the system using steady state equation with phasor diagram. (16)
13. a) Write short notes on :
- i) Current regulated PWM inverters. (8)
- ii) Selection of inverter. (4)
- iii) Selection of battery sizing. (4)
- (OR)
- b) Explain the different modes of operation of PV fed Buck-Boost converter in detail. (16)
14. a) Explain the operation of fixed speed and semi variable mode of wind energy conversion system with neat sketch. (16)
- (OR)
- b) Explain the circuit model of grid integrated solar system. (16)
15. a) Explain the operation of autonomous PV system with an MPPT converter and battery backup with neat sketch. (16)
- (OR)
- b) Explain any three different configuration of Hybrid renewable energy system in detail. (16)
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Question Paper Code : 20441

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

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 the principle of operation of wind turbine.
2. Mention some types of fuel used in biomass plant.
3. Draw the speed-torque curve of induction generator.
4. Explain briefly, the rotor construction of DFIG.
5. Draw the I-V and P-V characteristics of solar cell.
6. Mention the factors considered in the selection of inverter and battery sizing.
7. Mention some of the issues in stand-alone solar system.
8. Classify the types of WECS based on the rotational speed of turbines.
9. What are the types of hybrid system?
10. Define smart power tracker.

PART B — (5 × 16 = 80 marks)

11. (a) Explain with a neat diagram, the different types of concentrating type solar collector with its operation and working principles. (16)

Or

- (b) Explain the following with neat schematics : (16)
- (i) Biomass energy system
 - (ii) Energy from ocean.

12. (a) Illustrate the working and principle of grid connected PMSG in wind power plant. (16)

Or

- (b) Discuss the working principle of SCIG connected to a grid network and state its advantage for operating with wind turbine. (16)
13. (a) Explain the operation and control of matrix converter with its circuit diagram and switching condition. (16)

Or

- (b) Explain the operation of following converters : (16)
- (i) Three phase AC voltage controller
 - (ii) PWM inverter.

14. (a) Write a brief note on stand-alone operation of fixed and fully variable speed WECS. (16)

Or

- (b) Explain the operation of solar model in grid integrated system with and without battery backup. (16)
15. (a) Discuss different hybrid systems configurations consisting of wind turbine and solar power plant. (16)

Or

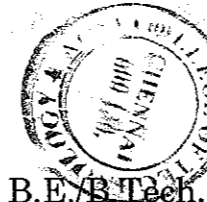
- (b) Explain the factors to be considered for placing the wind-PV system. Discuss its plant details, operating period and environmental aspects for assumed residential load. (16)

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Question Paper Code : 91474

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
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. What is called greenhouse gas effect ?
2. How Fuel Cell is treated as renewable energy source ?
3. Why Permanent Magnet Synchronous Generators are preferred for low speed wind applications ?
4. Distinguish between Squirrel Cage Induction Generator and Doubly fed Induction Generator.
5. What is the need for Buck-Boost converter for solar photovoltaic system ?
6. Write the special requirements of Grid Interactive inverters.
7. What are the technical issues to be considered for grid integration of wind energy conversion ?
8. How grid integrated system for solar PV differs from wind energy system ?
9. What is the need for hybrid energy system ?
10. What is called Maximum Power Point Tracking ?

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PART – B

(5×13=65 Marks)

PART – C

(1×15=15 Marks)

11. a) Explain the necessity for use of renewable energy sources and how renewable energy based power generation saves the environment ?

(OR)

b) Discuss the current status of biomass based renewable energy technologies and solar photovoltaic technologies.

12. a) Analyze the dynamic behavior of permanent magnet synchronous generator with respect to wind power variations.

(OR)

b) Draw the basic structure of Squirrel Cage Induction Generator and explain its operation. Also discuss its characteristics and uses.

13. a) Draw the power circuit of Boost converter used for solar Photovoltaic system and explain the operation for changing the DC voltage from one level to another level.

(OR)

b) Draw the power circuit for three phase PWM inverter used for wind energy conversion system and explain its operation.

14. a) Give a block diagram of photovoltaic conversion system which is designed to supply power to stand lone load. Describe the operation of main components used in it.

(OR)

b) With a functional block diagram, describe the functions of main components used in grid connected permanent magnet synchronous generator based wind energy conversion system.

15. a) Explain the various configuration of hybrid energy systems. Write down the merits and demerits of the different configurations.

(OR)

b) Write the commonly used Maximum Power Point Tracking (MPPT) algorithms for solar PV system. With the help of flow chart, explain perturb and observe MPPT algorithm.

16. a) Develop a block diagram of hybrid PV system which should be able to supply the power to the load for 24 hours without interruption. It should be using solar radiation, diesel and wind as the source of energy.

(OR)

b) A DC fan of 24 W needs to be run on solar PV during day time only. What should be the capacity of PV panel and power converter used in it ? Draw the power circuit configuration. List down all the possible design issues related to this arrangement.