*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

# Faculty of Engineering

## End Sem (Even) Examination May-2019

## EE3EL11 / EX3EL11 Power Electronics Application to RES

Programme: B.Tech. Branch/Specialisation: EE/EX

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Which of the following energy originate from the ocean? **1**

(a) Tidal energy (b) Sea energy

(c) Wind energy (d) Hydropower

ii. Which renewable energy source is the leading source globally to generate electric power? **1**

(a) Solar (b) Wind (c) Biomass (d) Geothermal

iii. What are used to convert wind energy into electrical energy? **1**

(a) Turbine (b) Generators

(c) Yaw motor (d) Blades

iv. Induction generator **1**

(a) Cannot work in isolation

(b) Can work in isolation

(c) Should work in parallel with synchronous generators

(d) Any of these

v. Winds having following speed are suitable to operate wind turbines. **1**

(a) 5 – 25m/s (b) 10 – 35m/s

(c) 20 – 45m/s (d) 30 – 55m/s

vi. For a buck converter to reduce the conduction losses in diode **1**

(a) Is a high on - resistance switch can be added in parallel

(b) Is a low on - resistance switch can be added in parallel

(c) Is a high on - resistance switch can be added in series

(d) Is a low on - resistance switch can be added in series

P.T.O.

vii. Which part of the wind mill acts as a housing for the turbine? **1**
(a) Wind Vane (b) Shaft
(c) Wind mill head (d) Turbine

viii. Which types of generator are made use in wind turbines? **1**
(a) Recreational generators (b) Synchronous generator
(c) Asynchronous generator (d) Alternator

ix. A hybrid energy system is **1**
(a) Saving fuel (b) Fulfil load demand
(c) Cost-effective (d) All of these

x. What does a hybrid energy system consist of? **1**
(a) Two or more renewable energy resources
(b) One renewable energy resource
(c) Two or more non renewable energy resources
(d) One non renewable and one renewable energy resources

Q.2 i. Explain renewable energy generation impacts on environment. **2**

ii. What is the meaning of biomass? Further discuss its multipurpose utilization. **3**

iii. Describe the main features of various types of renewable and non-renewable energy resources and explain the importance of non-renewable energy sources. **5**

OR iv. List out the available renewable energy sources. Explain how solar and wind energy sources plays significance role of electric power generation. **5**

Q.3 i. Compare IG and SCIG. **4**

ii. Explain doubly fed induction generator with neat sketch for wind energy conversion system. **6**

OR iii. Explain the constructional and working of permanent magnet synchronous generator for wind energy conversion system. **6**

Q.4 i. Explain power electronics converters in terms of renewable energy system. **4**

ii. Design a solar PV system for a rooftop mounted system wherein the load consists of a CFL, TV, fan etc. The power requirement is 875W



and energy requirement is 3800Wh. Minimum sunshine hours may be assumed as 5 hrs. Solar PV panel details are: 80W, $V_m$=17.6V, $I_m$=4.55A. Assume: battery efficiency=85%, inverter efficiency= charge controller efficiency =95%, operating factor=0.8.

OR iii. Draw a block diagram indicating the basic components of a wind electrical generator scheme. What is the advantage and disadvantage of wind energy system? **6**

Q.5 i. What is a grid connected renewable energy system? List out the problems involved in grid connection. **4**

ii. Explain the grid integrated SCIG based wind energy conversion system. **6**

OR iii. Explain the circuit model of grid integrated solar system. **6**

Q.6 i. What is the need for hybrid systems? Give the various configurations of solar PV hybrid system. **4**

ii. Give the block diagram of a PV-wind-battery energy system which should be able to supply the power to the load for 24 hours. **6**

OR iii. Show the power electronic system used for hybrid solar PV-wind energy system and explain its operation. **6**

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## Marking Scheme

## EE3EL11 / EX3EL11 Power Electronics Application to RES

| | | | |
|---|---|---|---|
| Q.1 | i. | Which of the following energy originate from the ocean?<br>(b) Sea energy | **1** |
| | ii. | Which renewable energy source is the leading source globally to generate electric power?<br>(b) Wind | **1** |
| | iii. | What are used to convert wind energy into electrical energy?<br>(a) Turbine | **1** |
| | iv. | Induction generator<br>(c) Should work in parallel with synchronous generators | **1** |
| | v. | Winds having following speed are suitable to operate wind turbines.<br>(a) 5 – 25m/s | **1** |
| | vi. | For a buck converter to reduce the conduction losses in diode<br>(b) Is a low on - resistance switch can be added in parallel | **1** |
| | vii. | Which part of the wind mill acts as a housing for the turbine?<br>(c) Wind mill head | **1** |
| | viii. | Which types of generator are made use in wind turbines?<br>(b) Synchronous generator | **1** |
| | ix. | A hybrid energy system is<br>(d) All of these | **1** |
| | x. | What does a hybrid energy system consist of?<br>(a) Two or more renewable energy resources | **1** |
| Q.2 | i. | Renewable energy generation impacts on environment. | **2** |
| | ii. | Meaning of biomass 2 marks<br>Its multipurpose utilization. 1 mark | **3** |
| | iii. | Features of various types of renewable and non-renewable energy resources 2 marks<br>Importance of non- renewable energy sources. 3 marks | **5** |
| OR | iv. | Renewable energy sources 2 marks<br>Solar and wind energy sources plays significance role of electric power generation. 3 marks | **5** |
| Q.3 | i. | Compare IG and SCIG.<br>1 mark for each point (1 mark * 4) | **4** |
| | ii. | Doubly fed induction generator<br>Diagram 2 marks<br>Wind energy conversion system 4 marks | **6** |
| OR | iii. | permanent magnet synchronous generator for wind energy conversion system<br>Construction 2 marks<br>Working 4 marks | **6** |
| Q.4 | i. | Power electronics converters in terms of renewable energy system.<br>1 mark for each converter (1 mark * 4) | **4** |
| | ii. | Rating of inverter 2 marks<br>Sizing of battery 2 marks<br>Sizing of PV 2 marks | **6** |
| OR | iii. | Basic components of a wind electrical generator scheme<br>Diagram 4 marks<br>Advantage and disadvantage of wind energy system 2 marks | **6** |
| Q.5 | i. | Grid connected renewable energy system 2 marks<br>Problems involved in grid connection. 2 marks | **4** |
| | ii. | Grid integrated SCIG based wind energy conversion system<br>Diagram 2 marks<br>Explanation 4 marks | **6** |
| OR | iii. | Grid integrated solar system<br>Circuit model 2 marks<br>Diagram 4 marks | **6** |
| Q.6 | i. | Need for hybrid systems 2 marks<br>Configurations of solar PV hybrid system 2 marks | **4** |
| | ii. | PV-wind-battery energy system<br>Block diagram 2 marks<br>Explanation 4 marks | **6** |
| OR | iii. | Power electronic system used for hybrid solar PV-wind energy system 3 marks<br>Its operation. 3 marks | **6** |

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