



**B.E DEGREE EXAMINATIONS: APRIL /MAY 2024**

(Regulation 2018)

Sixth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U18EEE0012: Power Electronics for Renewable Energy System

**COURSE OUTCOMES**

- CO1:** Distinguish various renewable energy sources and their significance
- CO2:** Describe the concepts of wind and solar energy conversion systems and the concepts of maximum power point tracking algorithms.
- CO3:** Configure the components of grid connected solar and wind energy systems
- CO4:** Apply the knowledge on different types of hybrid systems for various applications
- CO5:** Choose a power converter for the control of wind, solar and alternate energy systems.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|---|-----|-------------------|
| 1. Give any two environmental aspect of electric energy conversion.                   | CO1 | [K <sub>1</sub> ] |
| 2. Show the contributions of GHG Emissions in renewable energy generation?            | CO1 | [K <sub>2</sub> ] |
| 3. Draw the schematic of boost converter.   | CO2 | [K <sub>2</sub> ] |
| 4. How does solar radiation influence the performance of solar cells?                 | CO2 | [K <sub>L</sub> ] |
| 5. Differentiate between fixed and variable speed wind energy conversion systems.     | CO2 | [K <sub>3</sub> ] |
| 6. Why are induction generators preferred over DC generators in WECS?                 | CO2 | [K <sub>2</sub> ] |
| 7. Mention the major problems associated with grid integration of wind energy system? | CO3 | [K <sub>1</sub> ] |
| 8. What is line commutated inverter?  | CO3 | [K <sub>2</sub> ] |
| 9. Name the various types of hybrid energy systems.                                   | CO4 | [K <sub>1</sub> ] |
| 10. What is need of hybrid systems?   | CO4 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

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|-----|----|---|----|-----|-------------------|
| 11. | a) | Explain with neat diagrams of Alkaline Fuel Cells.  | 8  | CO1 | [K <sub>2</sub> ] |
|     | b) | Describe in detail the components of a wind turbine.  | 8  | CO1 | [K <sub>2</sub> ] |
| 12. | a) | Explain the operation of Perturb-and-Observe MPPT algorithms with flow chart.   | 8  | CO2 | [K <sub>3</sub> ] |
|     | b) | How does a solar PV water pumping system function? Explain it in detail with block diagram.   | 8  | CO2 | [K <sub>3</sub> ] |
| 13. | a) | Describe the Basic Principles of Wind Energy Conversion. Also drive the expression of power in wind.  | 8  | CO2 | [K <sub>3</sub> ] |
|     | b) | Explain the operation of a self-excited induction generator with a diagram.   | 8  | CO5 | [K <sub>3</sub> ] |
| 14. |    | Explain the block diagram of a solar photovoltaic system. Differentiate between standalone and grid-connected systems, including variations with and without battery storage. | 16 | CO5 | [K <sub>3</sub> ] |
| 15. | a) | With a neat schematic explain the integration of wind energy system with solar PV system.   | 8  | CO5 | [K <sub>3</sub> ] |
|     | b) | Describe the integration of a Wind-Diesel Hybrid System using a clear diagram.  | 8  | CO4 | [K <sub>3</sub> ] |
| 16. | a) | Discuss the operation of grid connected PMSG based wind energy conversion system with neat diagram.   | 8  | CO5 | [K <sub>2</sub> ] |
|     | b) | Detail the operation of a multilevel inverter.  | 8  | CO5 | [K <sub>2</sub> ] |

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