



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

**B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2023**

**Regulation: UG-20**

**WIND AND SOLAR ENERGY SYSTEMS**

**Time: 3 Hours**

**(ELECTRICAL AND ELECTRONICS ENGINEERING)**

**Max Marks: 70**

**Answer ALL questions in Module I and II**

**Answer ONE out of two questions in Modules III, IV and V**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

## MODULE – I

1. (a) How does electrical load matching affect the efficiency of a wind power system? Explain the concept of maximum power operation in a wind turbine. [BL: Understand| CO: 1|Marks: 7]
- (b) List and explain the environmental aspects that should be considered in the design and operation of wind power systems. [BL: Understand| CO: 1|Marks: 7]

## MODULE – II

2. (a) Discuss the challenges and potential solutions associated with the integration of solar power into existing electrical grids. [BL: Understand| CO: 2|Marks: 7]
- (b) What is peak power point operation? Explain the role of a synchronous generator in a solar thermal power plant. [BL: Understand| CO: 2|Marks: 7]

## MODULE – III

3. (a) Elucidate how do DC power conditioning converters contribute to optimizing power transfer in solar arrays? [BL: Understand| CO: 3|Marks: 7]
- (b) Outline the importance of maintaining a synchronized operation between a solar inverter and the grid. [BL: Understand| CO: 3|Marks: 7]
4. (a) List the different types of DC-DC converters used in solar power systems. Explain the operation of AC power conditioning converters used in solar plant. [BL: Understand| CO: 4|Marks: 7]
- (b) Describe the concept of maximum power point tracking (MPPT) and its significance in solar energy conversion. [BL: Understand| CO: 4|Marks: 7]

## MODULE – IV

5. (a) How does a SEIG provide controllable DC power? Explain the wind energy conversion systems with block diagram. [BL: Understand| CO: 5|Marks: 7]
- (b) Explain the impact of grid-related problems, such as voltage fluctuations and frequency variations, on WECS performance. [BL: Understand| CO: 5|Marks: 7]
6. (a) Infer the challenges and solutions related to grid integration in wind power systems. [BL: Understand| CO: 5|Marks: 7]

- (b) Demonstrate the role of AC voltage controllers in regulating the voltage output of wind turbines.  
[BL: Understand| CO: 5|Marks: 7]

### MODULE – V

7. (a) Name the power quality measuring equipment. Explain the significance of power quality in standalone renewable energy systems. [BL: Understand| CO: 6|Marks: 7]  
(b) Outline strategies for mitigating voltage fluctuations in renewable energy systems. Differentiate between standalone and grid-connected renewable energy systems. [BL: Understand| CO: 6|Marks: 7]
8. (a) Discuss about wind grid connected system and write about various units present in the wind grid connected system. [BL: Understand| CO: 6|Marks: 7]  
(b) Elucidate the custom power devices used in distributed generation and discuss about their functioning. [BL: Understand| CO: 6|Marks: 7]

