# NANDHA ENGINEERING COLLEGE, ERODE – 52
# (AUTONOMOUS)

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
## Subject Code & Name: 17EEX13-POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS
## QUESTION BANK
## UNIT – I

### PART A-2 MARK

1. List out the major factors influencing the amount of GHG emissions.
2. Give any two environmental aspect of electric energy conversion.
3. List the various renewable energy resources.
4. What is meant by spring and neap tides?
5. What are fuel cells?
6. What are the contributions of GHG Emissions in renewable energy generation?
7. What is hydrogen energy?
8. Define solar insolation.
9. How biomass conversion takes place?
10. Mention some of the organic materials used in bio-mass plant.
11. Mention the factors involved in biomass energy conversion.
12. What are the advantages of ocean wave power?
13. Name the domestic application of wind energy.

### PART B – 4 MARK

1. List out the salient features of renewable energy resources.
2. Justify how fuel cell becomes renewable energy source.
3. Mention the use of a fuel cell.
4. Mention the Advantages & Disadvantages of Solar energy system.
5. With neat diagram discuss ocean thermal energy conversion.
6. Discuss about anaerobic digestion? And its advantages
7. Identify the problems associated with tapping solar energy?
8. Compare horizontal axis wind turbine and vertical axis wind turbine.

### PART C -12 MARK

1. Explain the impact of renewable energy generation on environment in detail.
2. Illustrate fuel cell and write it types.

3. What is Hydrogen energy? Explain the operation of Hydrogen energy system with a neat schematic.
4. How does environment get affected by the use of the renewable energy? and also discuss GHG emissions from the various energy sources.
5. Discuss the influence of different renewable energy sources with special reference to the global warming context.
6. List out the available renewable energy sources.Explain how solar and wind energy sources plays significant role in electric power generation.
7. Describe the principle of generation of Bio gas and mention the factors affecting its generation.
8. What are the types of ocean thermal energy conversion power plants? Describe in detail the Anderson OTEC cycle.
9. Compare the power extraction aspects of solar PV system with wind energy system.

## UNIT – II

### PART A-2 MARK

1. Name any four types of generators used in wind energy conversion systems.
2. Write the significance of reference theory.
3. What is the principle of operation of induction generator?
4. What are the merits of squirrel cage induction generator for wind energy conversion?
5. Define tip-speed ratio.
6. What is meant by pitch angle control?
7. Draw the angular relationship of abc and dq winding in an induction generator.
8. What is the basic principle of wind energy conversion?
9. State the difference between induction generator and synchronous generator.

### PART B – 4 MARK

1. Differentiate between SCIG and DFIG.
2. Write is the principle of DFIG.
3. Why are induction generators preferred over DC generators in WECS?
4. Draw the equivalent circuit model of a PMSG.
5. Write the advantages of PMSG
6. Write the advantages of DFIG.
7. List the merits and demerits of capacitor excited induction generator.
8. Draw slip-torque characteristics of induction generator.

9. Draw the silp-torque characteristics of PMSG.
10. Bring out the merits and demerits of mains excited induction generator.
11. State the principle of PMSG.

**PART C -12 MARK**

1. Draw the schematic of Permanent Magnet Synchronous generator and explain the construction and principle of operation in detail. Also discuss the characteristics and issues briefly.
2. Explain the principle of operation and constructional features of squirrel cage induction generator with a neat diagram. Analyse the merits and demerits of the above.
3. Explain the principle of operation and constructional features of DFIG with a neat diagram. Analyse the merits and demerits of the above.
4. Draw the circuit model of self-excited induction generator and explain the methods used for steady state analysis.
5. Explain the analysis of Induction Generator used for Wind Energy Conversion System.
6. Draw the circuit model of PMSG and explain the methods used for steady state analysis.

## UNIT – III

**PART A-2 MARK**

1. Draw the block diagram of solar photovoltaic system.
2. Draw the schematic diagram of Buck-Boost Converter.
3. Define grid interactive inverter.
4. Define array sizing.
5. What is line commutated converters?
6. What is battery sizing?
7. Draw the schematic of boost converter.
8. What is three phase AC voltage controller?
9. What are the advantages of uncontrolled rectifier?
10. Define the photo conversion efficiency of the PV cell.

**PART B – 4 MARK**

1. Write the factors involved in battery sizing.
2. Write the advantages of AC voltage controller.
3. What is inversion mode of operation of line commutated inverter?

4. What is the significance of buck boost converter?
5. What is the function of boost converter in solar photovoltaic system.
6. List the advantages of buck boost converter.
7. What is the role of capacitor and the minimum value required for the boost converter?

**PART C -12 MARK**

1. Draw the block diagram of standalone solar photovoltaic system. What are the main components used in it? Explain their functions.
2. What is matrix converter? Discuss it in detail. Also state its advantages and limitations.
3. Explain the converters used for solar energy conversion.
4. Describe any two power conditioning system used in PV system.
5. Draw the block diagram of the solar PV system and explain the principle of operation in detail.
6. Describe the grid interactive inverters in detail.
7. Explain with neat diagram the philosophy of operation of a solar source fed boost converter.
8. Describe how a three phase line commutated converter is operated as an inverter.
9. Explain the operation of line commutated converter under inversion mode with the help of a neat circuit diagram and necessary waveforms.
10. Describe working of AC-DC-AC converter with circuit and wave form for wind energy conversion.
11. Analyse the principle of working of buck-boost converter with time ratio and current limit control. Draw the circuit and necessary waveforms.
12. Explain the following in detail:
    i. AC voltage controller
    ii. Voltage control in PWM inverters.

## UNIT – IV

**PART A-2 MARK**

1. What will happen if no load is connected to a solar PV system?
2. Write the role of back to back converter in wind energy conversion system.
3. What is meant by fault ride through capability?
4. Draw the basic block diagram of WECS.
5. Why pitch angle control is used for WECS?

6. What is stand-alone operation of fixed speed WECS?
7. What are the demerits of grid integrated WECS?
8. Draw the I-V characteristics of solar cell.
9. What are the major problems associated with grid integration of wind energy system?
10. What is inrush current?
11. Define grid integrated solar system.

**PART B – 4 MARK**

1. List out the issues to be addressed while integrating the solar PV systems with grid.
2. Differentiate between fixed and variable speed wind energy conversion systems.
3. Draw the schematic diagram of grid integrated PV system.
4. List out the grid connection issues.
5. What are the advantages of stand-alone operation of WECS?
6. What are the power quality issues that affect wind power integration?
7. What is islanding?
8. Define Fill Factor

**PART C -12 MARK**

1. Explain about the grid integrated permanent magnet synchronous generator in detail with relevant diagram and also discuss the issues of grid connection in detail.
2. Explain the stand alone operation of fixed speed wind energy conversion system.
3. Explain the stand alone operation of variable speed wind energy conversion system.
4. Explain the block diagram of SCIG based wind energy conversion system.
5. Explain with the help of a neat block diagram the functions of various blocks of a WECS.
6. Write short notes on grid integrated solar system.
7. Describe stand alone operation of solar energy conversion system.
8. Discuss in detail the grid system characteristics and explain with a neat diagram the stand alone and grid integrated solar system.
9. Explain how the isolation and temperature affects the I-V characteristics of a solar cell.
10. Explain about various grid connection issues and its impact on system stability.

## UNIT – V

**PART A-2 MARK**

1. What are hybrid systems?
2. List the advantages of hybrid renewable energy systems.
3. Write the importance of Maximum Power Point Tracking (MPPT) in the operation of a photovoltaic system.
4. Name the various types of hybrid energy systems.
5. What is the need for maximum power point tracking?
6. What is the range of hybrid systems?
7. What is MPPT?

**PART B – 4 MARK**

1. Write need of hybrid systems.
2. List the various MPPT techniques.
3. Write the merits of wind-diesel hybrid system.
4. What are the merits of Hybrid RES over the isolated RES?
5. What is the necessity of Maximum power point tracking in PV system?
6. Give the merits and demerits of MPPT.
7. Draw the schematic diagram of PV-Diesel hybrid system.

**PART C -12 MARK**

1. Explain the hybrid energy conversion system with neat sketch.
2. Explain MPPT techniques for WECS.
3. Is wind energy an excellent supplement to the PV? If so justify with a suitable case study.
4. Illustrate Diesel-PV hybrid system.
5. Draw and explain the operation of Wind-PV hybrid system.
6. What is MPPT? Discuss the types of MPPT with its merits and demerits. Explicate Incremental conductance method of MPPT algorithm
7. Discuss Fuzzy logic control method of MPPT algorithm.
8. Explain operating principle of PV Maximum Power Point Tracking in energy conversion.
9. Explain with case study how to get maximum power generation in wind energy conversion system.
10. Explain various strategies used for the operation of an MPPT.