Reg. No.																

Question Paper Code	14148

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/ DEC 2025

Sixth Semester

Electronics and Communication Engineering

20EEOE906 - INTRODUCTION TO RENEWABLE ENERGY SYSTEMS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following best describes the primary driver for sustainable design in renewable energy systems? (a) Maximizing energy output at all costs (b) Minimizing environmental impact over the system's life cycle (c) Reducing initial capital investment regardless of long-term effects (d) Prioritizing only locally available resources	1	K1	CO1
2.	The term "energy security" refers to: (a) Avoiding energy theft (b) Continuous availability of energy at affordable prices (c) Installation of smart meters (d) Nuclear energy production only	1	K1	CO1
3.	In a flat-plate solar collector, which component is primarily responsible for minimizing convective heat losses? (a) Absorber plate (b) Transparent cover (c) Insulation at the bottom (d) Fluid tubes	1	K1	CO2
4.	The performance of a photovoltaic cell is best characterized by: (a) Luminous flux (b) Fill factor (c) Ambient pressure (d) Internal resistance only	1	K1	CO2
5.	Betz's limit specifies that the maximum extractable power from wind is: (a) 100% of the wind's kinetic energy (b) 75% of the wind's kinetic energy (c) 59.3% of the wind's kinetic energy (d) 48.7% of the wind's kinetic energy	1	K1	CO3
6.	In wind turbine operation, tip-speed ratio refers to (a) Blade tip velocity divided by wind speed (b) Rotor diameter multiplied by angular velocity (c) Wind speed divided by rotor blade length (d) Ratio of blade chord length to rotor radius	1	K1	CO3
7.	Anaerobic digestion for biogas production is preferred because it: (a) Requires high temperatures and oxygen (b) Produces cleaner combustion gas (c) Is a low-cost aerobic method (d) Enables microbial breakdown without oxygen	1	K1	CO4
8.	Which of the following waste-to-energy technologies is most suited for high-moisture organic waste? (a) Gasification (b) Incineration (c) Anaerobic digestion (d) Pyrolysis	1	K1	CO4
9.	Which of the following energy systems best combines solar and wind resources for continuous energy supply? (a) Smart Grid Systems (b) Stand-alone solar PV systems (c) Wind-solar hybrid systems (d) Pumped hydro storage	1	K1	CO5
10.	In ocean thermal energy conversion (OTEC), the efficiency is typically low because: (a) Salinity variations reduce turbine performance (b) The temperature difference between ocean layers is small (c) It uses expensive photovoltaic technology (d) Tidal patterns are inconsistent	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Differentiate between renewable and non-renewable energy sources with examples.	2	K2	CO1
12.	What are the limitations of renewable energy sources in power generation?	2	K1	CO1
13.	Define sustainable design. How does it relate to energy systems?	2	K1	CO1
14.	Outline two important criteria for selecting a site for a Wind Power Plant.	2	K2	CO2
15.	Show the expression for power available in the wind and explain each term.	2	K2	CO2
16.	Extend any two challenges faced during the grid integration of Wind Power Plants.	2	K2	CO2
17.	Sketch the I–V characteristics of a solar cell.	2	K1	CO3
18.	What is Maximum Power Point Tracking (MPPT) in PV systems?	2	K1	CO3
19.	Define biomass and list any two biomass resources.	2	K1	CO4
20.	Name any two types of water turbines used in hydropower plants.	2	K1	CO4
21.	Infer how energy is generated from ocean waves.	2	K2	CO5
22.	Relate why energy storage is important in renewable energy systems.	2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Demonstrate the environmental impacts on energy sources.	11	K2	CO1
		OR				
	b)	Explain the status of non-conventional energy sources in India and their future prospects.	11	K2	CO1
24.	a)	Explain the major components of a typical Wind Power Plant with neat diagram. Discuss the role of each component in energy generation.	11	K2	CO2
		OR				
	b)	Explain the principle of wind energy conversion. Derive the expression for power available in the wind and discuss the factors affecting wind power generation.	11	K2	CO2
25.	a)	Summarize the basic principle of solar photovoltaic (SPV) conversion. Discuss different types of photovoltaic systems based on configuration and application.	11	K2	CO3
		OR				
	b)	Illustrate the construction and working of a central receiver solar thermal power plant. What are its advantages and limitations?	11	K2	CO3
26.	a)	Classify various biomass energy conversion processes. Explain any one process in detail with a suitable diagram.	11	K2	CO4
		OR				
	b)	With a neat sketch, describe the essential components of a mini or micro hydroelectric system. Explain the function of each component.	11	K2	CO4
27.	a)	Design a suitable hybrid renewable energy system for feeding isolated loads.	11	K2	CO5
		OR				
	b)	Relate with the help of neat diagram, explain the layout of a closed-cycle OTEC systems.	11	K2	CO5
28.	a)	Explain the working principle of a double-basin tidal power plant and describe its operating cycle in detail.	11	K2	CO5
		OR				
	b)	Explain the working principle of a fuel cell using a neat diagram and describe the performance characteristics of a hydrogen–oxygen fuel cell.	11	K2	CO5