PVP 23

Code: 23ME4501C

III B.Tech - I Semester - Regular Examinations - NOVEMBER 2025

RENEWABLE ENERGY TECHNOLOGIES

(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	What factors influence the amount of solar energy reaching Earth's surface?	L2	CO1
1.b)	Explain the working principle of a pyranometer and its role in measuring global solar radiation.	L2	CO1
1.c)	Describe the factors that influence the efficiency of a PV module.	L2	CO2
1.d)	Explain the importance of regular maintenance in photovoltaic battery systems.	L2	CO2
1.e)	What factors affect the performance of solar flat plate collector?	L2	CO3
1.f)	Explain the principle applications of solar distillation systems.	L2	CO3
1.g)	List the characteristics of a good wind power site.	L1	CO4
1.h)	Name various stokers used for the combustion of biomass.	L1	CO4
1.i)	What are the advantages and disadvantages of Geo-thermal energy?	L2	CO5
1.j)	Discuss the applications of fuel cells.	L2	CO5

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Discuss the potential of renewable energy sources in meeting global energy demands. How do they compare with conventional sources in terms of sustainability, availability, and environmental impact?	L2	CO1	5 M
	b)	Explain the Sun–Earth relationship and its significance in solar energy applications.	L2	CO1	5 M
OR					
3	a)	Write a note on solar radiation on tilted surfaces.	L2	CO1	5 M
	b)	What is a sunshine recorder and how does it measure the duration of bright sunshine?	L2	CO1	5 M
UNIT-II					
4	a)	Explain the circuit design and structural components of a photovoltaic (PV) module.	L2	CO2	5 M
	b)	Describe the mechanical insulation aspects of solar PV modules. What structural elements provide protection?	L2	CO2	5 M
OR					
5	a)	Compare different types of batteries used in solar PV systems. What are their advantages, limitations, and typical applications?	L2	CO2	5 M

	b)	Explain the step-by-step procedure for installing a battery bank in a solar PV system. What precautions must be taken to ensure safety and optimal performance?	L2	CO2	5 M
		UNIT-III			
6	a)	Compare flat plate collectors and concentrating collectors in terms of design, working principle, efficiency and applications.	L3	CO3	5 M
	b)	Discuss the importance of orientation and tilt angle in the performance of solar collectors.	L2	CO3	5 M
		OR			
7	a)	Describe latent heat storage and its role in thermal energy systems. How does it differ from sensible heat storage?	L2	CO3	5 M
	b)	Explain the working principle of solar water heating systems.	L2	CO3	5 M
		UNIT-IV			
8	a)	How energy from wind can be extracted? Explain the process by using suitable diagram.	L2	CO4	5 M
	b)	Derive Betz limit for Power generation in wind turbine.	L3	CO4	5 M
		OR			
9	a)	Explain any one type of gasifier with neat line diagram. Mention the merits & demerits of the same.	L2	CO4	5 M
	b)	Summarize the modification of SI engines to use biogas.	L2	CO4	5 M

UNIT-V					
10	a)	Discuss the potential of geothermal energy as a renewable resource. What are its advantages and limitations compared to other energy sources?	L2	CO5	5 M
	b)	Explain the principle of Ocean Thermal Energy Conversion (OTEC). Discuss the types of OTEC systems, their working mechanisms and the potential advantages and limitations.	L2	CO5	5 M
OR					
11	a)	Describe the applications of fuel cells across different sectors. How do fuel cells contribute to clean energy and decarbonization?	L2	CO5	5 M
	b)	What is Molten Carbonate Fuel Cells (MCFC)? Discuss their working principle, advantages and challenges in industrial applications.	L2	CO5	5 M