Total number of printed pages:02 **PG/1st/PGET101**

2023

GREEN ENERGY TECHNOLOGY

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Briefly write about renewable and non-renewable energy.	5+5=10
	b)	How will you define electrical, mechanical and heat energy ? Establish relations between electrical and mechanical energy and mechanical and heat energy.	3+3.5+3.5 =10
2.	a)	Define the following terms and differentiate between their meanings (i) Beam radiation and diffuse radiation (ii) Surface azimuth angle and solar azimuth angle	5+5=10
	b)	What are the different types of solar thermal energy collectors? Write briefly about any one of them.	2+8=10
3.	a)	Write about the formation of PN junction and describe photovoltaic effect phenomenon.	10
	b)	Write some important applications of solar photovoltaic systems.	10
4.	a)	Define the terms 'Drag' and 'Lift' in the study of wind energy.	5+5=10
	b)	Derive the fundamental equation of wind power. What do you mean by Betz limit ?	6+4=10
5.	a)	Write about the different modes of wind power generation.	10
	b)	Wind at one standard atmospheric pressure and 15°C has a speed of 10 m/s. A 10m diameter wind turbine is operating at 5 rpm with maximum efficiency of 40%. Calculate (i) the total power density in wind stream, (ii) the maximum power density, (iii) the actual power density, (iv) the power output of the turbine, and (v) the axial thrust on the turbine structure	5
	c)	Define the following – Pitch angle, swept area, yaw control, cut-in speed, solidity	1×5=5

6.	a)	Write some important advantages and disadvantages of hydro power generation.	3+3=6
	b)	How hydro power plants are classified ?	5
	c)	'Hydro power is the cleanest power generating system with very low running cost'- explain.	4
	d)	The following data relates to a hydroelectric power plant: Head: 400 m Discharge: 4.5 m^3/s Turbine efficiency: 82% Specific speed: 60 Determine the power developed, the type of turbine and the speed of the turbine.	5
7.	a)	Draw a top view of hydro power system and write about the following – Catchment area, surge tank, penstock, forebay, canal	2×5=10
	b)	The following data relates to a hydroelectric power plant: Head: 25 m Discharge: 400 m^3/s Turbine efficiency: 88% Frequency of generation: 50Hz Number of poles: 24 The generator is directly coupled to turbine. Calculate the least no of turbines required if (i) Francis turbine is used with a specific speed of 300, and (ii) a Kaplan turbine with a specific speed of 750 is used.	10

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