Total number of printed pages:4

PG/1st/PGET101

2021

GREEN ENERGY TECHNOLOGY

Full Marks: 100

Time

: Three hours

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

Answer any four questions from the first five questions and answer any one question from the last two.

1. a) What is biomass? Describe various types of biomass 3+7
   b) Write note on "Hydrogen as an energy carrier". 10

2. a) What are fuel cells? Describe the various types of fuel cells 4+6
   b) Describe the storage process of hydrogen 10

3. a) Describe the chemical characterization of biomass in detail 10
   b) What are various stages of anaerobic digestion? Describe each of them 4+6

4. Write notes on:
   a) Gasification 5
   b) Pyrolysis 5
   c) Acidogenesis 5
   d) Acetogenesis 5

5. a) Discuss the solar gravity system with proper diagram. 5

   b) Write down the working principle of a solar cell. 5

   c) Draw the schematic diagram of a grid-connected doubly fed wound rotor induction machine coupled with wind turbine. 10

6. a) What are the conventional classifications of hydropower projects according to station capacities? Accordingly, classify the projects in the following list of 15 selected small hydropower projects identified for development in the state of Assam (only write the type against the Sl. No. in your answer script).

(5 mark)

Sl. No.	Name of Project	Name of Stream	Longitude Deg Min Sec	Latitude Deg Min Sec	District	Head (m)	Capacity (MW)	Type of project
1	Bordikharu	Bordikharu	93 5 30	26 20 30	Karbi Anglong	180	2.00	
2	Dhansiri	Dhansiri	92 46 0	25 52 0	Darrang	9	20.00	
3	lungnit-1	lungnit	93 23 0	26 4 30	Karbi Anglong	50	3.00	
4	lungnit-2	lungnit	93 23 0	26 3 30	Karbi Anglong	44	3.00	
5	dalaima	dilaim	92 56 0	25 19 0	North Cachar	79	6.00	
6	jamuna	jamuna	93 31 45	26 2 30	Karbi Anglong	140	2.00	
7	kalanga	kalanga	92 42 0	25 53 0	Karbi Anglong	80	4.00	
8	disaidam	disai	94 24 45	26 35 10	Sivasagar	27	15.00	
9	Janghanri	Janghanri	93 28 30	26 18 0	Karbi Anglong	120	2.00	

10 Dere	Dere	92 53 0	25 23 0	North Cachar	140 1.00
11 Um-Mat	Um-Mat	92 20 15	25 49 15	Karbi Anglong	60 2.00
12 Amphi	Amphi	92 39 0	25 46 0	Karbi Anglong	80 6.00
13 Sunani	Sunani	92 27 39	26 6 0	Karbi Anglong	80 2.00
14 Jiri	Jiri	93 25 25	25 19 20	North Cachar	60 1.50
15 Dinar	Dinar nala	92 28 30	25 58 30	Karbi Anglong	40 0.50

b) Describe by providing schematic diagrams the three major categories of Small Hydropower Project (SHPs) based on the scheme of utilizing available water resources. Label your diagrams by indicating the major components and structures that are required to be constructed for implementing each of these three categories of SHP. 9

c) From the above table, provide your interpretation of the schemes on the Lungnit stream at Sl. No. 3 and 4. By assuming a combined mechanical efficiency of 90% give an estimate of the design discharge for each of these two schemes having the same Installed Capacity. 3

d) What are the parameters for selection of an appropriate type of turbine for an SHP? From the above table, give your preliminary selection of the types of turbines from the study of hydraulic head for the five projects of 2.00 MW capacity each. 3

OR

7. a) What do you mean by Ocean Thermal Energy Conversion (OTEC) technology? Describe the primary conditions for viability of OTEC projects. Give a schematic diagram by suitably labelling and explaining the operations of a closed-cycle OTEC power system. State a rule of thumb for assessing the quantity of water required for producing 100 MW of electricity in a renewable energy project employing OTEC technology. 10

b) What are the advantages and disadvantages of wave energy conversion projects? Name four common technological approaches for harnessing wave energy as a source of renewable energy. 5

c) What are the advantages and disadvantages of tidal power projects? Describe four technological approaches that may be employed for generating electricity by harnessing tidal energy. 5