32. a. Describe the working of fuel cell with its relevant equation. Also, mention the difference between fuel cell and battery. | 12 | 1 | 5 | 1

(OR)

b. Compare the storage methods available for fuel cells. Also discuss the recent challenges and trends in the development of fuel cell. | 12 | 1 | 5 | 1

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Reg. No.														

B.Tech. DEGREE EXAMINATION, NOVEMBER 2023

Sixth Semester

18EEO301T – SUSTAINABLE ENERGY

(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** should be answered in answer booklet.

Time: 3Hours | Max. Marks: 100

PART – A (20× 1 = 20 Marks) | Marks | BL | CO | PO

Answer **ALL** Questions

1. Identify from the following which is not under electromagnetic spectrum | 1 | 1 | 1 | 1
   (A) Laser light (B) UV rays
   (C) IR rays (D) Visible light

2. Select the data representing winter and shorter day | 1 | 1 | 1 | 1
   (A) 21st June (B) 21st December
   (C) 21st March (D) 21st September

3. Name the instrument used for measuring solar irradiance of a solar photo voltaic cell | 1 | 1 | 1 | 1
   (A) Multimeter (B) Photometer
   (C) Pyranometer (D) Sonometer

4. Indicate a single purest form of silicon crystal based solar cell | 1 | 1 | 1 | 1
   (A) Monocrystalline (B) Multicrystalline
   (C) Polycrystalline (D) Amorphous

5. Predict the range of wind speed suitable for wind power generation | 1 | 1 | 2 | 1
   (A) $(0-5)m/s$ (B) $(25-50)m/s$
   (C) $(50-75)m/s$ (D) $(5-25)m/s$

6. Locate the gear box in a horizontal axis wind turbine | 1 | 1 | 2 | 1
   (A) At the ground in the control room (B) At the bottom of the tower
   (C) At the top of tower (D) Inside and in the middle of the tower

7 A two blade wind turbine produces maximum power. Select the appropriate tip speed ratio. | 1 | 1 | 2 | 1
   (A) P (B) 2P
   (C) 3P (D) 4P

8. How much is the energy available in the winds over the earth surface is estimated to be? | 1 | 1 | 2 | 1
   (A) $2.9\times120\ MW$ (B) $1.6\times107\ MW$
   (C) $1\ MW$ (D) $5\ MW$

9	Identify the correct raw materials for forest waste based biogas generation (A) Leftover food, plastic rubber (B) Sugar mill, tannery, paper mill (C) Algae (D) Leftover food, plastic , rubber, algae	1	1	3	1
10.	Inspect the features of continuous type biogas plants (A) Gas production is intermittent (B) Retention period is more (C) Less problems as compared to batch type (D) Large digestion chambers are required	1	2	3	1
11.	Select an essential part for anerobic digestion. (A) High temperature (B) Oxygen (C) pH value (acidic) (D) Uniform feed rate	1	1	3	1
12.	Compared to fixed dome model of biogas plant, a floating drum type plant is (A) More efficient (B) Less efficient (C) Equally efficient (D) Very cheap	1	1	3	1
13.	The high and low water level difference of tide is called as _____ (A) Tidal range (B) Height (C) Tide frequency (D) Tide duration	1	1	4	1
14.	Identify the type of wave converter in floating generator (A) Dolphin (B) Steam (C) Rock (D) Saltor duck	1	1	4	1
15.	Identify the form of energy which is hardnessed from wave energy (A) Thermal energy (B) Chemical energy (C) Mechanical energy (D) Electrical energy	1	1	4	1
16.	Select the minimum tidal range required for power generation (A) 1 m (B) 5 m (C) 10 m (D) 7.5 m	1	1	4	1
17.	Define a fuel cell (A) An electro-mechanical energy conversion device (B) An electro-static energy conversion device (C) An electro-chemical energy conversion device (D) A thermo-electric energy conversion device	1	1	5	1
18.	Locate the drawback of fuel cell (A) High cost (B) High weight and cost (C) High efficiency (D) Non-availability of hydrogen	1	1	5	1
19.	Identify the type of fuel cell which is having lowest operating temperature (A) PAFC (B) PEMFC (C) SOFC (D) MCFC	1	1	5	1
20.	Indicate the simple method of hydrogen production (A) Electrolysis of water (B) Thermolysis of water (C) Steam reforming of methane (D) Biophotosynthesis	1	1	5	1

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	How solar energy can be used for power generation with the help of solar pond?	4	1	1	1
22.	Describe some of the features of wind energy conversion system.	4	1	2	1
23.	What are the advantages and disadvantages of bio-gas plants?	4	1	3	1
24.	Explain the working principle of OTEC briefly.	4	1	4	1
25.	Explain neap tide.	4	1	4	1
26.	Explain the difference between fuel cells and batteries.	4	1	5	1
27.	What are the advantages and disadvantages of fuel cell?	4	1	5	1

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.i.	Describe the working of photovoltaic cells and its types.	6	1	1	1
ii.	Discuss about role play of the solar PV in smart grid.	6	2	1	1
	(OR)				
b.	Discuss the following based on the application. (i) Solar pond	6	1	1	1
	(ii) Solar still	6	1	1	1
29. a.	How do you monitor and estimate wind energy?	12	2	2	1
	(OR)				
b.i.	Analyse the benefits of repowering in wind energy system.	6	2	2	1
ii.	List the components of wind energy conversion system and sketch the relevant diagram.	6	1	2	1
30. a.	Explain the operation of biogas digester with its relevant diagram. Also elaborate the factors affecting the performance of digester.	12	1	3	1
	(OR)				
b.	Explain and compare Co-firing and pyrolysis in biomass energy.	12	1	3	1
31. a.	Discuss the working of tidal power plant. Also analyze its advantages and disadvantages.	12	1	4	1
	(OR)				
b.	State Lambert law of absorption. Explain open and closed loop system for ocean energy conversion. Also, summarize their merits and demerits.	12	1	4	1