27. a.	Wind at 1 standard atmospheric pressure and 15°C has velocity of 15 m/.s. Calculate the						
	(i) Total power	5	1	2	2		
	(ii) Reasonable obtainable power	5					
	The turbine diameter 120 m, and turbine operating speed = 40 rpm at maximum efficiency. Propeller type wind turbine is considered.						
	(OR)						
b.	Illustrate with neat sketch on the working of HAWT power generation system.	10	1	2	1		
28. a.	Explain with a neat sketches, of any two biogas plants.	10	1	3	1		
	(OR)						
b.	Write short notes						
	(i) factors affecting bio digestion	5	1	3	1		
	(ii) Cofiring	5					
29. a.	With a neat sketch, explain the open loop system for ocean energy conversion.	10	1	4	1		
	(OR)						
b.	Write short notes on						
	(i) Double basin tidal energy conversion system	5					
	(ii) Site selection of tidal power plant	5	1	4	1		
30. a.	With a neat sketch, explain the principle of operation of phosphoric acid fuel cell.	10	1	5	1		
	(OR)						
b.	Write short notes on						
	(i) Performance characteristics of fuel cell	5	1	5	1		
	(ii) Issues associated with fuel cell power extraction	5					

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Reg. No.														

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022

Sixth / Seventh 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: 2½ Hours Max. Marks: 75

		Marks	BL	CO	PO
	PART – A (25 × 1 = 25 Marks)				
	Answer **ALL** Questions				
1.	The angular displacement of the sun from the plane of the earth's equator is called as	1	1	1	1
	(A) Inclination angle (B) Zenith angle				
	(C) Declination angle (D) Solar azimuth angle				
2.	When incoming solar radiation passes through the atmosphere of the earth?	1	1	1	1
	(A) Radiation of all wavelengths is absorbed uniformly by different types of molecules (B) Different molecules selectively absorb the radiation of different wavelengths				
	(C) There is no absorption of radiation in the atmosphere (D) There is total absorption of radiation				
3.	A solar cell is basically	1	1	1	1
	(A) A voltage source controlled by flux of radiation (B) A current source controlled by flux of radiation				
	(C) An uncontrolled current source (D) An uncontrolled voltage source				
4.	_____ is one of the most important materials used in the solar grade silicon.	1	1	1	1
	(A) Crushed silicon (B) Crystalline silicon				
	(C) Powered silicon (D) Silicon				
5.	_____ is that solar radiation received from the sun after its direction has changed by reflection and scattering by the atmosphere.	1	1	1	1
	(A) Global radiation (B) Direct radiation				
	(C) Beam radiation (D) Diffused radiation				
6.	The range of wind speed suitable for wind power generation is	1	1	2	1
	(A) 0 to 5 m/s (B) 10 to 40 m/s				
	(C) 50 to 70 m/s (D) 5 to 25 m/s				
7.	An anemometer is an instrument used for measurement of	1	1	2	1
	(A) Solar radiation (B) Wind speed				
	(C) Temperature gradient (D) Depth in ocean				

8. Wind blows because of difference in 1 1 2 1
(A) Temperature (B) Latitude
(C) Longitude (D) Wind turbine

9. When solar radiation falls in earth surface temperature of 1 1 2 1
(A) Land mass rises faster than water mass (B) Land mass rises slower than water mass
(C) Only land mass increases and water remains at fixed temperature (D) Land mass and water mass rises uniformly

10. The wind turbine rotor having low value of solidity 1 1 2 1
(A) Runs slower (B) Runs faster
(C) Produces high torque (D) Have low efficiency

11. The optimum solid concentration in a biomass is 1 1 3 1
(A) 7% - 9% (B) 17%-19%
(C) 10% - 11% (D) 20%- 21%

12. Which one of the following is an example of starch crops biomass feed stocks? 1 1 3 1
(A) Sugar cane (B) Wheat straw
(C) Corn Stover (D) Orchard prunings

13. Which of the following term is higly related with biogas generator? 1 1 3 1
(A) Batch process (B) Incineration
(C) Yaw process (D) Crucification

14. Which material should be added in the feed of a biogas plant to increase nitrogen content? 1 1 3 1
(A) Lignin (B) Carbohydrate
(C) Chopped leguminous plants (D) Night soil

15. Compared to the fixed dome model of a biogas plant, a floating drum type plant 1 1 3 1
(A) Is more efficient (B) Is less efficient
(C) Is equally efficient (D) Is very cheap

16. The turbine used in tidal range plant is a 1 1 4 1
(A) Pelton turbine (B) Kaplan turbine
(C) Francis turbine (D) Jancy turbine

17. The overall efficiency of an OTEC (Ocean Thermal Energy Conversion) power plant is 1 1 4 1
(A) 2-3% (B) 10-15%
(C) 15-20% (D) 20-25%

18. Wave energy is basically harnessed in the form of 1 1 4 1
(A) Thermal energy (B) Chemical
(C) Mechanical energy (D) Electrical energy

19. Deep water surface waves are those where the 1 1 4 1
(A) Water depth is more than 1000 m (B) Water depth is more than 100 m
(C) Water depth is more than the wavelength (D) Water depth is more than about half the wavelength

20. The minimum tidal range required for power generation is about 1 1 4 1
(A) 1 m (B) 5 m
(C) 10 m (D) 20 m

21. Widespread use of fuel cell is windered mainly due to 1 1 5 1
(A) Its high cost (B) Its high weight and size
(C) Its high efficiency (D) Has availability of hydrogen

22. Which fuel cell has the heighen operating temperature? 1 1 5 1
(A) PAFC (B) PEMFC
(C) SOFC (D) MCFC

23. As a load is applied on an open circuited fuel cell and it is gradually increased 1 1 5 1
(A) Its efficiency increases (B) Its output voltage increases
(C) Its output voltage remains unchanged (D) Its output voltage decreases

24. 95% of the hydrogen production in USA is met 1 1 5 1
(A) Through electrolysis of water (B) Through thermolysis of water
(C) Through steam referring of methane (D) Through biophotosynthesis

25. The maximum theoretical energy efficiency of a fuel cell 1 1 5 1
(A) 100% (B) 69%
(C) 50% (D) 83%

PART – B (5 × 10 = 50 Marks) Marks BL CO PO
Answer **ALL** Questions

26. a. A solar cell having an area of $25cm^2$ gives a current of 0.85 A and voltage 0.55 V at maximum power point. The short circuit current is 0.9 A and open circuit voltage is 0.65 V. What is the fill factor, maximum power point and efficiency of solar cell? Consider STC. 10 3 1 2

(OR)

b. Write notes about the following angles 10 2 1 1
(i) Tilt angle
(ii) Azimuth angle
(iii) Hour angle
(iv) Declination angle
(v) Solar altitude angle