Reg. No.															

B.Tech. / M.Tech. (Integrated) DEGREE EXAMINATION, MAY 2024
Fourth Semester

21CHE351T – RENEWABLE ENERGY ENGINEERING
(For the candidates admitted during the academic year 2021-2022 , 2022-2023 & 2023-2024)

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** and **Part - C** should be answered in answer booklet.

Time: 3 Hours | Max. Marks: 75

PART – A (20 × 1 = 20Marks) | Marks | BL | CO | PO
Answer **ALL** Questions

1. Which of the following is a renewable energy resource? | 1 | 1 | 1 | 3,1
   (A) Coal (B) Natural gas
   (C) Solar (D) Petroleum

2. What is the primary source of energy for electricity generation in India? | 1 | 1 | 1 | 3,1
   (A) Coal (B) Wind
   (C) Nuclear (D) Hydro

3. Which technique focuses on reducing energy consumption through behavioural changes? | 1 | 2 | 1 | 3,1
   (A) Energy auditing (B) Energy cropping
   (C) Energy conservation (D) Energy conversion

4. What is the potential environmental impact of using fossil fuels as the primary energy source? | 1 | 3 | 1 | 3,1
   (A) Reduced greenhouse gas emissions (B) Increased air quality
   (C) Acid rain formation (D) Preservation of biodiversity

5. Which of the following is a direct application of solar energy? | 1 | 1 | 2 | 1,3
   (A) Geothermal heating (B) Hydroelectric power generation
   (C) Solar pumping (D) Nuclear fusion

6. What is the primary function of a solar collector? | 1 | 1 | 2 | 1,3
   (A) To store solar energy (B) To convert solar energy into electricity
   (C) To absorb and transfer solar energy (D) To reflect solar energy

7. Which type of solar collector is commonly used in solar water heating systems? | 1 | 1 | 2 | 1,3
   (A) Flat plate collector (B) Parabolic trough collector
   (C) Fresnel lens collector (D) Solar tower collector

8. What is the function of a solar concentrator? 1 1 2 1,3
   (A) To disperse solar energy
   (B) To focus solar energy onto a small area
   (C) To store solar energy for later use
   (D) To convert solar energy into mechanical energy

9. Which type of wind turbine is commonly used for large-scale commercial wind farms? 1 1 3 1,3
   (A) Vertical axis
   (B) Horizontal axis
   (C) Cross-axis
   (D) Diagonal axis

10. What is the primary function of Betz's theorem in wind energy conversion? 1 2 3 1,3
   (A) To minimize wind turbine noise
   (B) To maximize power extraction efficiency
   (C) To regulate wind turbine speed
   (D) To reduce wind turbulence

11. Which parameter affects the performance of wind turbines by describing the speed and direction of the wind? 1 1 3 3,2
   (A) Blade length
   (B) Tip speed ratio
   (C) Wind velocity
   (D) Rotor diameter

12. Which wind power form utilizes the kinetic energy of the wind to generate electricity? 1 1 3 3,2
   (A) Mechanical wind power
   (B) Thermal wind power
   (C) Chemical wind power
   (D) Electrical wind power

13. Which of the following is a renewable source of biomass? 1 1 4 1,3
   (A) Coal
   (B) Natural gas
   (C) Wood
   (D) Petroleum

14. What is the primary composition of biomass? 1 1 4 1,3
   (A) Hydrogen and oxygen
   (B) Carbon and nitrogen
   (C) Carbon and hydrogen
   (D) Oxygen and nitrogen

15. Which biomass conversion technology involves the incomplete combustion of biomass to produce heat and biochar? 1 1 4 1,3
   (A) Direction combustion
   (B) Pyrolysis
   (C) Gasification
   (D) Anaerobic digestion

16. What is the primary product of biogas technology through anaerobic digestion? 1 1 4 1,3
   (A) Methane
   (B) Ethanol
   (C) Hydrogen
   (D) Butanol

17. What is the primary source of energy for tidal power generation? 1 1 5 1,3
   (A) Wind
   (B) Sun
   (C) Moon
   (D) Earth's rotation

18. Which type of energy is harnessed from the motion of ocean waves? 1 1 5 1,3
   (A) Solar energy
   (B) Tidal energy
   (C) Wave energy
   (D) Geothermal energy

19.	Which technology utilizes the temperature difference between warm surface water and cold deep water for energy production? (A) Tidal energy (B) Wave energy (C) OTEC (D) Geothermal energy	1	1	5	1,3
20.	What is the primary method of geothermal energy production? (A) Fracking (B) Drilling (C) Mining (D) Excavation	1	1	5	1,3

PART – B (5 × 8 = 40 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
21. a.	Compare and contrast different energy cropping methods used in India. Assess their environmental impacts and potential for sustainable energy production.	8	4	1	1,3
	(OR)				
b.	Explain the concept of energy management and its significance in sustainable development.	8	1	1	3,7
22. a.	Explain the concept of solar angles and their significance in solar energy systems with examples.	8	2	2	1,3
	(OR)				
b.	Discuss the types and configurations of solar collectors used in solar energy systems with neat diagram.	8	1	2	1,3
23. a.	Describe the working procedure of horizontal axis and vertical axis wind turbines with neat schematic.	8	3	3	1,3
	(OR)				
b.	Explain Betz's theorem on maximum power extraction from wind energy.	8	2	3	1,3
24. a.	Explain the process of anaerobic digestion in biogas technology, including the mechanisms of methane production.	8	1	4	1,3
	(OR)				
b.	Discuss the different biomass conversion technologies, including direct combustion, pyrolysis and gasification.	8	2	4	1,3
25. a.	Explain the working mechanism of tidal energy conversion and the factors influencing the efficiency of tidal power generation.	8	1	5	1,7
	(OR)				
b.	Explain the operating principles of open and closed-cycle OTEC systems, including the advantages and limitations of each approach.	8	2	5	1,7

PART – C (1 × 15 = 15 Marks)

Answer **ANY ONE** Questions

	Marks	BL	CO	PO
26. Discuss the regional prospects and stresses of energy in India, highlighting the challenges faced in balancing energy demand and supply. Provide examples to support your answer.	15	1	1	1,7
27. Explain briefly on the types, working of solar concentrators with a neat schematic diagram and also mention its applications.	15	1	1	1,7

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