Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree (S, FE) Examination May 2024 (2019 Scheme)

Course Code: MET445

Course Name: RENEWABLE ENERGY ENGINEERING

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1	The difference between the daytime and night-time temperature is minimum in coastal areas. But in deserts, there is a large swing between the daytime and night-time temperatures. Why?	(3)
2	Under what conditions can electric cars be considered as "zero-emission" vehicles?	(3)
3	How is current density defined? What are light-induced recombination current and dark current or reverse saturation current?	(3)
4	Describe the solar radiation properties of a window that is ideally suited for minimizing the air-conditioning load.	(3)
5	Consider two locations with the same wind speed and ambient air temperature but one location is at a higher altitude than the other. Which location has more wind power potential? Why?	(3)
6	Explain the terms a) Solidity b) Cut-in speed c) Cut-out speed	(3)
7	Describe the principle of Ocean Thermal Energy Conversion (OTEC) system.	(3)
8	Explain the different geothermal energy resources with their temperature ranges	(3)
9	Why are we interested in hydrogen production by water electrolysis instead of steam reforming from natural gas? Explain.	(3)
10	What are the main constituents of biogas? What are the sources of biogas?	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Define the following terms and differentiate between their meanings a) Beam radiation and Diffuse radiation b) Surface azimuth angle and solar azimuth angle c) Local clock time and local apparent time	(6)

b) Calculate the sun's altitude and azimuth angle at 8.30 AM solar time on March 18 for a location at 35^0 N latitude (8)

OR

12 a) Calculate the angle made by beam radiation with the normal to a flat plate collector in New Delhi (27^0 30' N, 76^0 42' E) on October 29, at 10.00 AM solar time. The collector is tilted at an angle of 35^0 with the horizontal and is pointing due south. Also calculate the day length. (8)

b) What is nuclear energy? Briefly describe fission and fusion reactions. (6)

Module II

13 a) Explain a) Sensible heat storage b) latent heat storage c) Thermo-chemical energy storage (6)

b) With neat sketches explain the working of a) Trombe wall b) Solar cooker (8)

OR

14 a) With a neat diagram, explain the working of a central receiver power plant (8)

b) State the advantages, disadvantages and applications of flat plate collectors (6)

Module III

15 a) List the characteristics of a good wind power site (6)

b) Give the comparison between horizontal and vertical axis wind machines (8)

OR

16 a) Wind at one standard atmospheric pressure and 15^0C has a speed of 10 m/s. A 10 m diameter wind turbine is operating at 5 rpm with maximum efficiency of 40 %. Calculate (10)

a) The total power density in wind stream
b) The maximum power density
c) The actual power density
d) The power output of the turbine
e) The axial thrust on the turbine structure

b) Discuss the different types of wind turbines used to extract wind energy (4)

Module IV

17 a) With a neat sketch, explain the construction and working of a Dolphin type wave power machine (7)

b) With a schematic diagram, explain the working of a Claude cycle OTEC plant (7)

OR

18 a) Explain about tidal power plant with a neat sketch? Kerala state has a long coastal area, discuss the environmental impact of installing a tidal power project (8)

b) With a neat sketch, explain the working of a binary cycle geothermal power plant (6)

Module V

19 a) What are the sources of biomass energy? Why is it a renewable energy source? Explain. (6)

b) Explain with neat sketch the construction and working of Janata model biogas plant (8)

OR

20 a) Explain any four methods to obtain energy from biomass (8)

b) Give comparison between fixed dome type and movable drum type biogas plants (6)

****