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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination December 2022 (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		Define a) Solar constant b) Air mass c) Irradiance	(3)
2		List greenhouse gases. Explain the science of greenhouse effect	(3)
3		What is the difference between active and passive solar applications? Give examples of active and passive solar applications.	(3)
4		Describe about solar pond with a sketch?	(3)
5		Explain the terms a) solidity b) Cut-in speed c) cut-out speed	(3)
6		Explain the environmental impacts of wind turbines	(3)
7		Discuss the advantages and disadvantages of tidal power plant	(3)
8		Define and discuss geothermal gradients	(3)
9		Explain the various factors affecting the performance of a biomass digestor	(3)
10		State the advantages of a continuous type biogas plant	(3)

PART B

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

Module I

11	a)	Explain briefly the impact of conventional sources of energy on environment	(6)
	b)	Calculate the angle made by beam radiation with normal to a flat plate collector on November 30, at 9.00 AM solar time for a location at $27^0 30'$ N. The collector is tilted at an angle of latitude plus 12^0, with the horizontal and is pointing due south.	(8)

OR

12	a)	How is nuclear fission different from nuclear fusion? Discuss the method of energy generation in both the cases	(6)

b) Calculate the average value of global solar radiation on a horizontal surface for March 21, at the latitude of 12^0 N. The ratio of average length of solar day and length of the longest solar day is 0.68. The constants a = 0.28 and b = 0.5 (8)

Module II

13 a) Give the comparison between flat plate collectors and concentrating collectors (6)

b) With a neat sketch, explain the working of a medium temperature solar power generation cycle (8)

OR

14 a) What are the components of solar liquid flat plate collectors? Draw a solar liquid flat plate collector and discuss the critical requirements of cover plate and absorber plate for the efficient working of the collector? (8)

b) With a neat diagram, explain the working of a solar absorption refrigeration system (6)

Module III

15 a) Define power coefficient of wind turbines. Derive an expression for power coefficient. Explain Betz Criterion and its significance? (8)

b) Discuss briefly the effect of tip speed ratio (TSR) on torque and solidity (6)

OR

16 a) With neat sketches, explain the different types of wind turbines used to extract wind energy (6)

b) What are the advantages and disadvantages of wind energy conversion systems? (8)

Module IV

17 a) Explain about binary cycle geothermal power generation (6)

b) With the help of a neat sketch, explain the working of a closed cycle OTEC system and mention its advantages and limitations (8)

OR

18 a) Explain with the help of a neat schematic diagram, the working of a 'Dry-steam open system' used for geothermal power generation. State it's environmental aspects. (6)

b) 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)

Module V

19 a) With a neat sketch, explain the construction and working of floating drum type biogas plant (KVIC model). State its advantages and disadvantages (10)

b) What is biomass? List the different resources used to extract biomass energy (4)

OR

20 a) Why hydrogen is called a secondary energy source? Explain the various methods of hydrogen production (8)

b) Discuss the process of production of ethanol from biomass (6)

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