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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree (S, FE) Examination May 2023 (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 Identify six potential renewable energy sources that could replace the ways that energy is now used. (3)
- 2 What is Air Mass? How it can be used as the measure of solar Irradiance? (3)
- 3 Differentiate between sensible and latent heat storage. (3)
- 4 List the essential parts needed to generate low-temperature thermoelectric power. (3)
- 5 What is a Windrose Diagram? Explain with a model diagram. (3)
- 6 Explain Betz limit theory? (3)
- 7 What is OTEC? List out various cycles used in OTEC systems. (3)
- 8 Construct a block diagram of a vapour dominated geothermal system. (3)
- 9 Name the different processes used for hydrogen production (3)
- 10 What are the major drawbacks of using bio-ethanol as an alternate fuel? (3)

**PART B**

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

**Module I**

- 11 a) Explain the following terms related to solar geometry (i) Hour Angle ((ii) Zenith Angle (iii) Surface azimuth angle (iv) Declination angle with proper sketches (7)
- b) For New Delhi (28° 03' N, 77° 12' E), calculate the zenith angle of the sun at 2:30 PM on February 2015. The standard IST longitude for India is 81° 44' E. (7)

**OR**

- 12 a) Explain the working of a thermopile pyranometers with a neat sketch (7)
- b) Substantiate your answer for promoting electric vehicles in Kerala, which is a densely populated state. Is there any disadvantages in future? (7)

**Module II**

- 13 a) What are solar pond? Explain with a neat sketch (7)
- b) Explain the working of a heat pipe evacuated tube collector with a neat sketch (7)

**OR**

- 14 a) How a latent heat energy storage system works? Sketch a Two-tank direct molten salt thermal storage system with a heliostat field and a power block. (7)
- b) Explain the production process of a solar photovoltaic cells (7)

**Module III**

- 15 a) What are the different configurations of Wind Turbines? Explain with simple sketches (7)
- b) Describe the swept area, capacity factor, and survival wind speed in relation to wind turbines. (7)

**OR**

- 16 a) What are the basic components of a wind turbine? (7)
- b) Derive an expression for the actual power generation for a wind turbine. Differentiate VWT and HWT (7)

**Module IV**

- 17 a) With a neat sketch explain the working of an open cycle OTEC system (7)
- b) Explain any two methods to harness wave energy from ocean with neat sketch (7)

**OR**

- 18 a) With a neat sketch explain the Anderson cycle OTEC plant (7)
- b) Explain with a neat sketch the working of liquid dominated Flashed steam Hydrothermal system (7)

**Module V**

- 19 a) What are the different gasifiers used in the conversion of biomass to energy? (7)
- b) What are the different environmental challenges in biomass processing technologies? (7)

**OR**

- 20 a) Explain the construction and working of khadi village industries commission biogas plant (KVIC - floating type) (7)
- b) Define Payback time, Return on investment and Life cycle cost (7)

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