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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination December 2024 (2019 Scheme)

Course Code: EET322

Course Name: RENEWABLE ENERGY SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1	What are the objectives and significance of the United Nations Framework Convention on Climate Change (UNFCCC) in addressing environmental challenges?	(3)
2	Write short notes on the harmful effects of any two pollutants produced by energy conversion processes.	(3)
3	How are solar radiation data measured, and what are the instruments used for this purpose?	(3)
4	With a neat diagram of typical characteristics of a solar cell, discuss the concept of MPPT. What is the role of the converter in MPPT?	(3)
5	Compare fixed-speed and variable-speed drive schemes in wind energy conversion systems (WECS), highlighting their advantages and limitations.	(3)
6	Suggest a hydropower generation scheme that has a very minimal negative effect on the scenic view of the stream running through a tourist place. Sketch out a schematic diagram for the hydropower generation system.	(3)
7	A double basin arrangement can increase the amount of energy harvested from a tidal power generation system; Justify this statement.	(3)
8	What are the criteria used in the selection of suitable sites for OTEC power plants and discuss the importance of each criterion.	(3)
9	How can urban waste-to-energy projects contribute to sustainable development goals in urban areas?	(3)
10	Illustrate how a pumped hydro power station can be used as an energy-storing option.	(3)

PART B

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

Module I

11 a) How harvesting more energy from non-renewable sources can adversely affect human health and the environment in terms of various pollutants? Give ideas to reduce the effects and save the environment. (7)

b) Explain how effective is the global collaboration in implementing the United Nations Framework Convention on Climate Change (UNFCCC) in addressing environmental concerns related to energy usage and greenhouse gas emissions. (7)

OR

12 a) Compare the availability and limitations of conventional and non-conventional energy resources in the context of sustainable development. How can the increased use of non-conventional energy resources mitigate environmental impacts while supporting economic growth? (7)

b) Discuss key mechanisms and initiatives outlined in the Kyoto Protocol and analyse their impact on global climate change mitigation efforts. (7)

Module II

13 a) With a neat diagram, explain the construction and working of a flat plate type solar thermal collector system. Mark all the parts in the diagram and give the common materials used for the different parts. (10)

b) What is the fill factor of a solar cell and how does its value affect the efficiency of a solar cell? (4)

OR

14 a) Elaborate on the steps involved in the design of a stand-alone PV system having a few days of autonomy. Clearly state the role of SOC of battery in a stand-alone system. (10)

b) Illustrate how a central tower collector type solar thermal collector system can be used for electrical generation. (4)

Module III

15 a) Derive the expression for Betz's limit for a wind turbine system. (10)

b) Classify micro, mini, and small hydro projects based on their capacity and scope, discussing their respective advantages. (4)

OR

16 a) Compare horizontal-axis wind turbines (HAWT) and vertical-axis wind turbines (VAWT) detailing their construction and advantages. (7)

b) Explain the basic concepts and types of turbines used in small hydropower generation, highlighting their design characteristics and operational considerations. (7)

Module IV

17 a) Differentiate the working principle of a tidal energy conversion system and an ocean thermal energy conversion system. State the advantages and disadvantages of these schemes. (6)

b) What makes a hybrid OTEC system preferable to the Anderson and Claude cycle-type OTEC? Explain its works with a block diagram. (8)

OR

18 a) How is a single-basin tidal power generation classified based on the mode of power generation? (7)

b) What is biofouling? What are the methods to avoid and remove biofouling in the OTEC system? (7)

Module V

19 a) Identify factors affecting biogas generation from organic waste materials. How do these parameters affect the gas production? (7)

b) Explain the principle of operation behind fuel cells and their potential applications in energy conversion and storage. What are the advantages of fuel cell technology compared to conventional power generation methods? (7)

OR

20 a) Compare the construction difference between KVIC and Janta model bio-gas plant. (7)

b) Discuss the concept of hydrogen energy and its role in the transition towards a hydrogen-based economy. What are the challenges associated with hydrogen production, storage, and distribution? (7)

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