

Reg. No. :

Question Paper Code : 50547

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Seventh Semester

Electrical and Electronics Engineering

EE 8703 — RENEWABLE ENERGY SYSTEMS

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the methods to reduce the greenhouse effect.
2. What are the limitation of solar energy utilization techniques?
3. List the advantages of wind energy.
4. What do you understand by the term of solidity ratio of the wind turbine?
5. List out the advantages of concentrating collector over flat plate collector.
6. The maximum efficiency of the solar cells are very low – Justify this statement.
7. Draw the aerobic digestion of organic waste by 3 stage biochemical processing techniques.
8. Identify the environmental impact of extraction geothermal energy.
9. Compare the fuel cell and battery.
10. Define the tidal range with respect to tidal power plant.

PART B — (5 × 13 = 65 marks)

11. (a) Brief about the contribution of renewable energy source as on 2022 under National and International level in energy consumption and generation scenario. Also forecast the Indian future energy management in 2040. (8+5)

Or

- (b) Explain the consequence of environmental impact of fossil fuel utilization. Mention the importance of the renewable energy source for the present Scenario. (6+7)

12. (a) Draw the line diagram of various types of wind mill blades and write their advantages and disadvantages.

Or

- (b) In a particular site, the atmospheric pressure is 1.01325 bar and temperature is 25°C. The wind is available at 9 m/sec. Evaluate the following :

- (i) Power density available in the site (3)
(ii) Maximum Power density possible (3)
(iii) Obtainable power density assuming the over all efficiency is 35% (3)
(iv) Power density of the windmill if the diameter is 50 m and (2)
(v) Axial thrust force action on the wind mill blade. (2)
13. (a) As an Engineer, identify the favorable points for developing a solar thermal based power generation projects at your home town. Also share the merits and demerits of the same based on their performance. (8+5)

Or

- (b) A photovoltaic cell has some open circuit voltage of 1.0 Volts and a short circuit current of 260 A/m², at a cell temperature at 28°C. Calculate the voltage and current density that maximizes the power of the cell. Estimate the corresponding maximum power output per unit cell area? If the solar radiation falling on the cell is 900 W/m², and the cell size is 25 cm × 25 cm, compute the instantaneous conversion efficiency of the cell? And give the value of Fill factor of cell.

14. (a) (i) Explain with neat sketch of various methods of energy harvesting techniques in geothermal source. List out their merits and demerits. (9+4)

- (ii) Elaborate the site selection process for micro hydro power plant erection.

Or

- (b) Explain any one type of gasifier with neat line diagram. Mention the merits and demerits of the same. (9+4)

15. (a) (i) Explain the methods of energy extraction technique on ocean tidal energy source. (5)
- (ii) How do you estimate the power potential of ocean tidal energy source? (5)
- (iii) List out the limitations of tidal energy conversion system. (3)

Or

- (b) Explain the construction of various types of fuel cells.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Explain with neat diagram of cow dung used biomass gasifier. (7)
- (ii) Design a bio gas gasifier for a community hall located in Village of Yelagiri hills, Tamil Nadu. In this village has a total population of 300 families with 120 mens, 80 womens and 100 children. The bio gas consumption for food preparation of the tribalpeople are 300 litres for men, 200 litres for women and 100 litres for children respectively. A buffalo yields an average of 40 kg of dung every day. The average estimated the gas production from the dung is around 10 litres/kg of dung. Estimate the number of buffaloes required to meet the gas requirement for food preparation for that tribal people. The density of slurry is 1090 kg/m³. Estimate the size of the digester if the Height : Diameter ratio is 3:1. (8)

Or

- (b) (i) Design a Stand-alone solar PV for an emergency 24 hours × 7 days clinic room. The following data were observed during the operation hours. The clinic has 10 tube lights, 5 Fans, 2 PC with 200 Watts, 1 Water cooler with 750 watts. Assume the average solar radiation available in Vellore is 800 W/m². Estimate and form array the battery and module requirements. (5)
- (ii) The manager of the clinic wants reduce the electrical consumption by replacing all the tube lights LEDs of 28 Wafts with same light illumination. Redesign the sizing of solar PV system for the revised proposal. (5)
- (iii) Suggest suitable hybrid system for uninterrupted power supply by completely renewable energy sources. (5)