

Roll No.

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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

Mechanical Engineering Department

VII Semester

25

ME 9022 - New & Renewable Energy Sources

(Regulation 2008)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Find the Declination in degrees for the date June 21 using Cooper's equation
2. Define Fill Factor (FF) of a Solar Cell with an equation
3. Write the equation for obtaining maximum power from a horizontal axis wind machine. Establish the value for Power Coefficient C_p using this equation
4. Define Solidity & Tip Speed Ratio of a Wind Machine.
5. How Biomass & Biogas are differentiated ?
6. Name 2 sources of Biodiesel production in India. What is the by-product of Biodiesel by esterification process
7. Define Spring Tide & Neap Tide and state how they are caused ?
8. List 2 advantages & 2 disadvantages of wave energy extraction
9. Explain : Liquid hydrogen is superior to gasoline on weight basis and inferior on volume basis
10. Define Polarization in a Fuel Cell and how it is measured ?

Part – B (5 x 16 = 80 marks)

11. (i) State the characteristics of a good wind power site (4)
(ii) List the Merits & Demerits of Horizontal Axis & Vertical Axis Wind Turbines (6)
(iii) Wind at atmospheric pressure & at a temperature of 20° C has a velocity of 10 m/s. The turbine diameter is 12 m and speed of rotation is 45 rpm (6)
Estimate : (i) Total power density of wind stream
(ii) Maximum obtainable power density (Take $\eta = 40\%$)
(iii) Total Power Generated
12. a) (i) What are the main components of a Flat Plate Solar Collector and explain the function of each? (10)
(ii) Write briefly on Solar Concentrating Collector & Solar Pond (6)
OR
b) Write on the following w.r.t Solar Photovoltaic Systems :
(i) Doping (4)
(ii) Components of PV system integrated with Power Grid (6)
(iii) Different types (atleast 3) of Solar Cells with their respective characteristics (6)

13. a) (i) Name 3 methods generally employed for extracting energy from Biomass and explain any 2 in detail (10)
(ii) What is Energy Plantation and mention its advantages? (6)

OR

- b) Write on the following :
(i) Biogas Generation through Anaerobic Digestion of Biodegradable Wastes - a detailed information (10)
(ii) Production of Ethanol from Sugarcane (6)

14. a) (i) Explain the basic principle of OTEC System (4)
(ii) Describe Closed Cycle OTEC with its advantages over Open Cycle System (6)
(iii) Ocean Wave has an amplitude of 1.5 m with a period of 7 seconds. Calculate the following : Wave Length, Wave Velocity and Energy Density (Take $\rho_{\text{sea water}} = 1020 \text{ kg / m}^3$) (6)

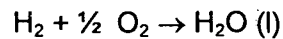
OR

- b) (i) List the advantages & disadvantages of Geothermal Energy over other renewable energy forms (8)
(ii) Write the operation principle of Single Basin arrangement type of Tidal power plant with single effect and double effect scheme (8)

15. a) (i) Explain any 2 methods of H_2 production on a commercial scale (8)
(ii) List the safety precautions to be taken up in storage of H_2 (4)
(iii) What do you understand by solid storage of H_2 ? (4)

OR

- b) (i) Explain the Merits & Demerits of Fuel Cell (6)
(ii) How Fuel Cell and Battery Power Storage System can be compared ? (6)
(iii) Find the reversible voltage for $\text{H}_2 - \text{O}_2$ fuel cell having the reaction (4)



Take $\Delta G = - 237.3 \text{ kJ / gm - mole of H}_2$ & $F = 96 500$