Roll No. | | | | | | | | | | |

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

Mechanical Engineering Department

25

VII Semester

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 η = 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 $H_2 - O_2$ fuel cell having the reaction *(4)*

$H_2 + ½\ O_2 \rightarrow H_2O$ (l)

Take $\Delta G = -237.3$ kJ / gm – mole of H_2 & F = 96 500