Registration No :

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M.Tech.
PDPE208

2nd Semester Back Examination 2017-18
ALTERNATIVE ENERGY
BRANCHE : PRODUCTION ENGG,
PRODUCTION ENGG AND OPERATIONAL MGT
Time : 3 Hours
Max Marks : 70
Q.CODE : C1093
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1   **Answer the following questions:** *Short answer type :*   (2 x 10)
   a) What do you mean by energy yield ratio?
   b) What do you mean by greenhouse effect?
   c) Differentiate between solar thermal and solar photovoltaic system.
   d) Define Solar Constant. Why extraterrestrial radiation deviates from the solar constant value?
   e) What are the major applications of geothermal energy?
   f) What do you mean by furling speed in wind energy conversion system?
   g) What is a fuel cell and what are its main advantages?
   h) Write the expression for tidal power.
   i) What are the advantages and disadvantages of an MHD generator?
   j) What is the working principle of solar cell?

Q2 **a)** What is the effect of variation of insolation and temperature on PV characteristics?   **(5)**
   b) A PV system feeds a dc motor to produce 3 hp power at the shaft. The motor efficiency is 85%. Each module has 36 multicrystalline silicon solar cells arranged in a 9 x 4 matrix. The cell size is 125mm x 125mm and the cell efficiency is 12%. Calculate the number of modules required in the PV array. Assume global radiation incident normally to the panel is 1 kW/m^2.   **(5)**

Q3 **a)** Derive Betz limit of power extraction in wind energy conversion system.   **(5)**
   b) Find the diameter of the turbine rotor disk and rotational speed of the turbine having 3 blades. Generator required to provide an electric power of 1000 kW at a wind speed of 10 m/s and having a maximum efficiency of 90% for a tip speed ratio of λ= 6. Take C_p= 0.4 and ρ= 1.226 kg/m^3.   **(5)**

Q4 **a)** Briefly explain Power Vs. Speed characteristics of wind turbine.   **(5)**
   b) A propeller-type wind turbine has the following data: Speed of free wind at a height of 10m= 10m/s, ρ= 1.226 kg/m^3, α= 0.14, Height of tower= 100 m, Diameter of rotor= 70m, Wind velocity at the turbine reduces by 20%, Generator efficiency = 85%. Find (a). Total power available in wind (b). Power extracted by the turbine (c). Electrical power generated.   **(5)**

Q5 **a)** Differentiate between passive and active solar water heating system. **(5)**
b) Derive the efficiency of a liquid flat plate collector. **(5)**

Q6 **a)** Derive efficiency of a fuel cell. **(5)**
b) Explain VI characteristics of fuel cell. **(5)**

Q7 **a)** Describe briefly types of geothermal resources. **(5)**
b) What is the working principle of MHD generator and show its equivalent **(5)**
circuit.

Q8 **Write short notes on any TWO of the following :** **(5 x 2)**
a) I-V characteristic of solar cell.
b) Ocean Thermal Energy Conversion Technology.
c) Solar Distillation
d) Ocean Tidal Energy Conversion Schemes.