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Total Number of Pages: 02

M.Tech
PDPE208

2nd Semester Back Examination 2016-17

Alternate Energy

BRANCH: PRODUCTION ENGG, PRODUCTION ENGG AND OPERATIONAL MGT

Time: 3 Hours

Max Marks: 70

Q.CODE: Z1068

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)**
- a) What is a fuel Cell? How they are classified?
 - b) What is wind farm? List any four locations of wind farm in India.
 - c) Explain the function of solar chimney.
 - d) Explain the meaning of passive heating and cooling.
 - e) Explain the term air mass and albedo.
 - f) What is a small, mini, and micro hydro power plant
 - g) What is magma?
 - h) What is the process/event responsible for movement of carriers after creation of electron hole pair due to radiation?
 - i) Write the collector tilt angle in northern hemisphere for optimum gain in heating applications in winter season.
 - j) What are the parameters that influence the output voltage and current in a thermionic convertor?
- Q2 a) Explain the Hall effect in MHD generator and methods adopted to overcome the limitations.State major advantages and disadvantages of MHD power generation (5)**
- b) What is the present status of development in fuel cell technology? Draw a simple sketch of H₂ – O₂ fuel cell and explain its working. (5)**
- Q3 a) What is sun drying and state its advantages. Differentiate between open sun drying, direct solar drying and indirect solar drying. Explain each with the help of suitable sketches. (5)**
- b) Draw a neat sketch and explain the following solar geometries with significance (5)**
- (i) Hour angle
 - (ii) Solar azimuth angle
 - (iii) Declination angle

- Q4 a)** What is total power of a wind stream? On what factors do the performance of a wind mill depends. How the power output of wind turbines controlled and utilized? **(5)**
- b)** Design a rotor for a multi blade wind turbine that operates in a wind speed of 35 kmph to pump water at a rate of $7\text{m}^3/\text{h}$ with a lift of 6.5 m. also calculate the angular velocity of the rotor. Data given: efficiency of the rotor to pump = 80%. $C_P = 0.3$, $\lambda = 1.0$ and air density = 1.2 kg/m^3 . **(5)**
- Q5 a)** Discuss in details about the factors influencing the design of solar PV array. **(5)**
- b)** An ideal PV cell produces 2.5 W at 0.5 V during certain environmental conditions. Compute the output power, current and voltage , if the cells are connected in the following arrangements, **(5)**
- (i) When the PV cells are connected as a panel of four parallel columns and each Column has 10 series cells.
- (ii) When several panels are connected as array of two parallel columns and each column has four series modules.
- Q6 a)** Explain in brief the conversion of tidal energy into electrical energy and note down how the deficiencies of simple single pool tidal system corrected in a modulated single pool tidal system. **(5)**
- b)** Describe the functioning of an open cycle OTEC plant. What are the relative advantages and limitations of floating a shore – based OTEC plants? **(5)**
- Q7 a)** Classify geothermal sources. With the help of a neat sketch describe the working of a hot rock type geothermal power plant. List its merit, demerits and application. **(5)**
- b)** Explain various solar thermal energy storage systems? **(5)**
- Q8 Write short answer on any TWO:** **(5 x 2)**
- a)** Instruments use to measure solar radiation
- b)** Working of a non convective solar pond
- c)** Solar passive cooling techniques
- d)** Central tower concept of utilizing solar energy for electricity generation