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Total Number of Pages: 02

**M.Tech**  
**PDPE208**

**2<sup>nd</sup> Semester Regular/ Back Examination 2015-16**  
**ALTERNATIVE ENERGY**  
**Q.CODE:W787**  
**Time: 3 Hours**  
**Max marks: 70**

**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) State the limitations of Nernst equation?
  - b) How the semi-crystalline solar cells are commonly manufactured?
  - c) Name the materials used for the manufacture of Poly- crystalline thin film solar cell?
  - d) What is the significance of figure of merit of a thermoelectric material?
  - e) Distinguish between global radiation and diffuse radiation.
  - f) How the efficiency of a flat plate collector can be improved?
  - g) What are the factors considered for the installation of wind power generation station?
  - h) Draw a flow diagram of a modified open cycle OTEC plant..
  - i) What is enhanced geothermal systems?
  - j) Name the major characteristics of a thermal energy storage system.
- Q2 How a fuel cell does operate? Name how fuel cells are classified? (10)  
Explain the electro chemistry of  $H_2 - O_2$  of fuel cell ?
- Q3 How is electricity generated by thermoelectric means? What is figure of merit? What are the suitable materials for thermoelectric elements? (10)  
Discuss the merits of thermoelectric generators.
- Q4 Why sun tracking of concentrating collectors is needed? Discuss (5+5)  
different methods of sun tracking
- Q5 a) Draw a neat sketch and explain the following solar geometries with (4)  
significance
- (i) Hour angle
  - (ii) Solar azimuth angle
  - (iii) Declination angle
  - (iv) Tilt angle

- b) Determine the average value of total radiation on a horizontal surface at a location (latitude  $22^{\circ} 13'N$ , Longitude  $73^{\circ} 13'E$ ) during the month of March. If constant  $a$  and  $b$  are given equal to 0.28 and 0.48 respectively and average sun shine hours per day are 10. (6)
- Q6 a) Name and explain in brief the different parameters on which the efficiency of a liquid solar flat plate collector depends? (5)
- b) Describe principle of operation of a solar pond. and analyze how temperature gradient develops in a solar pond ? (5)
- Q7 a) Define different types of mechanical control used in wind energy conversion system. How the pitch control associated with the type of generator used in WECS? (4)
- b) A propeller type wind turbine having blade diameter of 60 m is in operation at a speed of 175 rpm with a wind velocity of 25 m/sec the atmospheric air temperature being  $30^{\circ}C$  What are the various methods of tidal energy generation? Explain in details. Calculate the total power density in the wind, Maximum obtainable power density and average total power at normal conditions with an efficiency of 30%. (6)
- Q8 (a) Briefly explain different types of geothermal sources namely, hydrothermal, geo-pressurized and petro-thermal. What is hot dry rock? How can it be used to produce power? (5)
- (b) With a schematic diagram, explain the working of an oscillating hydraulic piston wave energy pumped storage plant (5)