Hall Ticket No | | | | | | | | | | | Question Paper Code: BPE701

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - February, 2017

Regulation: IARE–R16

RENEWABLE ENERGY SYSTEMS
(Common to ES|(CAD/CAM)|STE)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Define solar radiation and electromagnetic spectrum. Explain how a solar cell works. **[7M]**

   (b) Taking a solar power content of 1 W/cm^2 at the space-station location, calculate the area of solar panels required at 20 efficiency of conversion for powers of 2000 MW, 2400 MW, 35000 MW and 70000 MW. **[7M]**

2. (a) Write about reflection and anti-reflection coating. **[7M]**

   (b) The reflection coefficients of some semiconductors are: Te = 0.28, CdTe = 0.19. Calculate the indices of refraction for them. **[7M]**

UNIT – II

3. (a) Write elaborately on Magneto Hydro Dymanic (MHD) generator, explaining its parts. **[7M]**

   (b) An MHD duct has the dimensions, w=0.59m, h=0.34m and l=1.69m (Volume = $0.339m^3$). The magnetic field strength is B=3.9T along h, and the gas velocity is u=550/s along l. At a performance coefficient of K=0.60, calculate: **[7M]**

      i. Generated voltage and its gradient E_1 inside the duct;

      ii. Load voltage and the gradient E caused by it inside the duct.

4. (a) Write in detail types of wind turbines highlighting their classification. **[7M]**

   (b) The undisturbed wind speed at a location is v_i=35 mile/hr, the speed at turbine rotor is 65% of this value and the speed at exit is 32% of v_i. The rotor diameter is 10m.$\rho = 1.297kg/m^3$. Calculate: **[7M]**

      i. v_i in m/s.

      ii. Power available in undisturbed wind at the turbine rotor

      iii. Power in the wind at outlet

      iv. Power developed by turbine

      v. the value of C_p.

UNIT – III

5. (a) What are the generating modes with respect to a tidal project? **[7M]**

   (b) A tidal project has installed capacity of 3000MW in 64 units each of 34MW rated output. The head at rated output is 5.52m. The embankment is 4 miles long = 6.4km. Again assume 95% efficiency for both turbine and generator. The generation is 5 hours twice a day. Calculate **[7M]**

   i. The quantity of water flowing through each turbine & total flow out of the tidal basin.

   ii. The surface area of the reservoir behind the embankment and the wash.

   iii. Energy produced in TW-h per year.

6. (a) Write short notes on following types of Open Thermal Energy Conversion Schemes: **[7M]**

   i. Closed-Cycle System

   ii. Open Cycle System

   (b) A tidal power station has 34 generators each of 10 MW operating at a maximum head of 13.5 m. It generates for two 6-hour periods per day. Calculate the basin capacity in m^3, and annual energy production. Again assume 93% efficiencies. **[7M]**

UNIT – IV

7. (a) Write about coal gasification with special reference to Lurgi's coal gasification. **[7M]**

   (b) What is meant by thermo-chemical gasification and list out gasification steps. **[7M]**

8. (a) Discuss about Global Energy Position. **[7M]**

   (b) Write briefly about the pollution-free energy systems. **[7M]**

UNIT – V

9. (a) After listing the types of fuel cells write about: **[7M]**

   i. Polymer Electrolyte Membrane Fuel Cells (PEMFC)

   ii. Direct Methanol Fuel Cells (DMFC)

   (b) Explain Hydrogen-Oxygen Fuel cells with the help of a neat and labeled diagram. **[7M]**

10. (a) Write about the various applications of fuel cells with respect to their power. **[7M]**

    (b) Discuss Li-ion batteries as a feasible ones for large scale power application and briefly write about its disadvantages. **[7M]**