Code: 13A03605 **R13**

B.Tech III Year II Semester (R13) Regular Examinations May/June 2016

NON CONVENTIONAL SOURCES OF ENERGY

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Explain solar constant.
(b) Explain solar surface azimuth angle.
(c) What do you understand by instantaneous efficiency and stagnation temperature?
(d) Define: (i) Aperture. (ii) Concentration ratio.
(e) Write the equation for total power available in wind and draw a graph for it.
(f) Write energy balance equation for a well-mixed sensible heat liquid storage tank.
(g) Briefly explain energy from bio mass.
(h) Briefly explain four main elements necessary for exploiting geothermal energy.
(i) Write two differences between fuel cell and battery.
(j) Write about figure of merit.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Define declination.
(b) Calculate total radiation on tilted surface at 30^o to horizontal at Delhi (28.68^oN) on March 22. The horizontal beam and diffuse radiation are 60 W/m^2 and 150 W/m^2 respectively and solar time is 11 AM. Take albedo of ground is 0.2.

OR

3 (a) Briefly explain the instruments used for measuring solar radiation.
(b) Explain terrestrial radiation.
(c) Calculate the: (i) Zenith angle. (ii) Solar azimuth angle for a place with latitude 43^o at 9.3 AM solar time on February 13.

UNIT – II

4 (a) With the help of figure, draw the thermal resistance network showing collector losses FPC.
(b) A FPC operates when the total radiation on the surface is 760 W/m^2. Calculate the outlet temperature of water, useful heat extracted and stagnation temperature from the following data:
(i) Mass flow rate = 0.02 kg/s.
(ii) Collector in fluid temperature = 43^oC.
(iii) Ambient Temperature = 26^oC.
(iv) Effective optical efficiency = 0.77.
(v) Effective heat loss coefficient = 1.65 W/m^2K.
(vi) Specific heat of water = 4.18 kJ/kg K.

OR

5 A cylindrical parabolic concentrator is having 2.5 m width 9 m length. The outside diameter of the absorber tube is 6.5 cm. The collector is used to heat a fluid whose temperature at the inlet of the absorber is 160^oC and the flow rate is 450 kg/hr. The beam radiation falling on the collector is 700 $W/m^{2.}$ The ambient temperature is 28^o. Estimate: (i) Useful heat gain rate. (ii) Instantaneous collection efficiency based on beam radiation alone. The following fluid and optical properties may be used:
Cp = 1.26 kJ/kg^oC, $\rho = 0.85$, $(\tau\alpha)_b = 0.78$, $v = 0.93$, Collector efficiency factor (F') = 0.85 and overall heat transfer loss coefficient $U_l = 7$ $W/m^{2o}C$.

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UNIT – III

6 (a) Explain cabinet solar dryer with a suitable sketch.

(b) Wind is flowing at 1 std. atm pressure and 15^{o}C temperature. Through a propeller type wind turbine with a velocity of 25 m/s. Assuming a turbine diameter of 60 m and a turbine wheel revolution of 50 RPM, estimate. (i) The maximum obtainable density. (ii) Torque at maximum efficiency. (iii) Axial thrust.

OR

7 (a) Explain the concept and principle of working of solar pond.

(b) With a neat sketch explain space heating system using liquid FPC.

UNIT – IV

8 With a neat sketch explain biomass gasification.

OR

9 With the help of flow diagram and T-S diagram explain flash steam power plant.

UNIT – V

10 (a) With a neat sketch explain alkaline fuel cell.

(b) For a thermoelectric power generation following parameters are given:

Temperature of hot reservoir = 700^{o} K

Temperature of sink = 300^{o} K

Figure of merit for the material, Z = 2 x 10^{-3} K^{-1}. Find the efficiency of the thermoelectric generator. What will be the Carnot efficiency?

OR

11 With a neat flow diagram explain different components of MHD generator (Open cycle).

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