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10ME754

Seventh Semester B.E. Degree Examination, June/July 2016
Non-Conventional Energy Sources

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the conventional and non-conventional energy sources? Explain briefly. **(08 Marks)**

b. With sketches, explain the production of oil from oil shale and Tar sands. **(12 Marks)**

2 a. Explain the working principle of pyrheliometer with sketch. **(10 Marks)**

b. Define the following terms:
(i) Latitude (ii) Zenith angle (iii) Solar altitude angle
(iv) Hour angle (v) Local apparent time. **(10 Marks)**

3 a. Explain beam, diffuse, reflected and total radiation flux on a tilted surface. **(07 Marks)**

b. Calculate the monthly average hourly radiation falling on a flat-plate collector facing south (Y = 0) with a slope of 15°, given the following data:
Location : Chennai (13° 00′ N)
Month : October Time : 1100 – 1200 h (LAT)
$\bar{I}_g$ = 2408 kJ/m^2-h $\bar{I}_d$ = 1073 kJ/m^2-h
Assume ground reflectivity to be 0.2 representative day in October (October 15th) **(05 Marks)**

c. Name the different types of solar thermal power cycles and explain any one type with a neat sketch. **(08 Marks)**

4 a. With neat sketch, explain liquid flat-plate collector. **(10 Marks)**

b. Plot the variation of τ_r, τ_a and τ with the angle of incidence for the following cover system:
Material : Glass Number of covers : 2
Thickness of each cover : 4 mm Refractive index of glass relative to air : 1.52
Extinction coefficient of glass : 15 m^{-1} Angle of incidence : 15°. **(10 Marks)**

PART – B

5 a. With a sketch, explain principle of working of a solar cell. **(08 Marks)**

b. With a neat sketch, explain the vertical axis wind machine. **(04 Marks)**

c. A wind turbine generator is designed to produce 3.5 × 10^6 kWh/year with a plant coefficient of 0.45. The conversion efficiency is 0.73. The mechanical, generator efficiencies are 0.9 and 0.96 respectively. The wind velocity is 45 kmph and air density of 1.185 kg/m^3 and a temp. of 25°C. Calculate the required rotor diameter and power coefficient. **(08 Marks)**

6 a. Explain the harnessing energy in Tidal power plant with a sketch. **(08 Marks)**

b. With a neat sketch, explain the working principle of OTEC (closed) plant. **(08 Marks)**

c. State the environmental problem associated with geothermal energy conversion. **(04 Marks)**

7 a. What is anaerobic digestion? **(02 Marks)**
b. With a neat sketch, explain the Indian bio-gas plant. **(10 Marks)**
c. Write brief note on Energy Plantation. **(05 Marks)**
d. What are the applications of Bio-gas? **(03 Marks)**

8 a. What are the different methods of producing hydrogen? Explain any one of them. **(10 Marks)**
b. Write brief notes on :
i) Transportation of hydrogen
ii) Storage of hydrogen **(10 Marks)**

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