USN | | | | | | | | | | | | | | | | **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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