

VII SEMESTER B.TECH. (MECHANICAL ENGINEERING) END SEMESTER MAKE UP EXAMINATIONS, DEC 2016/JAN 2017

SUBJECT: RENEWABLE ENERGY SYSTEMS [MME 447]

REVISED CREDIT SYSTEM (02/01/2017)

Time: 3 Hours

MAX. MARKS: 50

3

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- Missing data may be suitably assumed.
- **1A.** With a neat sketch label and explain the solar geometry.
- 1B. With neat sketch explain the working of a suitable device that can be used to measure beam and diffused radiation from the sun.
- Describe with a neat sketch the process of conversion of solar energy into electricity using suitable temperature cycle that makes use of parabolic trough concentrators for harnessing solar energy.
- A liquid flat plate collector with single glass cover has the following data: 2A. Length of collector=1.6m Width of collector = 1.2mExtinction coefficient of glass = 15/mGlass plate thickness = 2mm Refractive index of glass to air=1.526 Beam radiation flux = 400W/m² Diffuse radiation flux = $150W/m^2$ Tilt factor for beam radiation=0.9384 Tilt factor for diffuse radiation=0.9741 Tilt factor for reflected radiation = 0.0052Transmissivity based on reflection-refraction for beam radiation= 0.8445 Angle of refraction for beam radiation = 18.72° Angle of incidence for diffuse radiation = 60° Diffuse reflectivity of cover system = 0.2Glass cover emissivity/absorptivity = 0.7 Find the incident solar radiation flux absorbed by the absorber plate
- **2B.** Give the importance of collector heat removal factor and collector efficiency factor in liquid flat plate solar collector
- 3

5

2C.	Mention the applications of solar energy.	2
3A.	With a neat sketch and labeling explain the power generation process by oscillating float air pump wave machine ?	3
3B.	Explain with a neat sketch the Claude cycle ocean thermal energy conversion system.	4
3C.	Explain briefly the various site selection criterions for a wind energy plant	3
4A.	With a neat sketch and clear labeling explain the biogas generation process using fixed dome type biogas plant. Emphasize on the various stages of biomass digestion process	4
4B.	With a neat sketch diagrams show the formation of ethanol from molasses.	3
4C.	Mention and explain the stages of biogas production involving anaerobic digestion.	3
5A.	Mention the demerits of thermoelectric power generation.	2
5B.	Explain with a neat sketch the working of HDR power generation system	4
5C.	With a neat sketch explain the magneto hydro dynamic system which uses a high temperature inert gas stream to pass through the magnetic field.	4
6A.	Find the monthly average hourly global radiation on a horizontal surface at the location $(20^{\circ}35'N, 77^{\circ}E)$ for the time 0930-1000h (IST) using the following data: Month: March 15 th Average sunshine hours per day = 9 Sunrise hour angle = 95.18° Equation of time correction = - 4min Standard longitude for the location = 82.5°E. Monthly average solar radiation indicated by a pyranometer at the location is 600W/m ² .Assume solar constant as 1367 W/m ² and constants a=0.698 and b= 0.386.	4
6B.	Mention the limitations of bulb turbine and tube turbine	2
6C.	Mention the factors affecting biogas generation form anaerobic digestion	4