Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University, Manipal

V SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER MAKE-UP EXAMINATIONS, DECEMBER 2017

SUBJECT: NON CONVENTIONAL ENERGY SOURCES [MME 4025]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Sketch, label and explain the solar geometry. **3**

1B. With neat sketch explain the working of a suitable device that can be used to measure beam and diffused radiation from the sun. **4**

1C. 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. **3**

2A. A liquid flat plate collector with single glass cover has the following data:

Length of collector=1.6m

Width of collector = 1.2m

Extinction coefficient of glass = 15/m

Glass plate thickness = 2mm

Refractive index of glass to air=1.526

Beam radiation flux = 400W/m^2

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 = 0.0052

Transmissivity based on reflection-refraction for beam radiation= 0.8445

Angle of refraction for beam radiation = 18.72^o

Angle of incidence for diffuse radiation = 60^o

Diffuse reflectivity of cover system = 0.2

Glass cover emissivity/absorptivity = 0.7

Find the incident solar radiation flux absorbed by the absorber plate. **5**

2B. Give the importance of collector heat removal factor and collector efficiency factor in liquid flat plate solar collector. **3**

2C. Mention the applications of selective surfaces. **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 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. **3**

5B. Find the monthly average hourly global radiation on a horizontal surface at the location ($20^{o}35$'N, 77^{o}E) for the time 0930-1000h (IST) using the following data:

Month: September 23rd

Average sunshine hours per day = 9

Sunrise hour angle = 95.18^{o}

Equation of time correction = - 4min

Standard longitude for the location = 82.5^{o}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**

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. **3**