Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER EXAMINATIONS, NOVEMBER 2022

RENEWABLE ENERGY [ELE 4086]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 17 November 2022** **Max. Marks: 50**

Instructions to Candidates:

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

1A. Calculate the angle of incidence on a horizontal plane surface at Kolkata, at 14:00 h (IST) on 21st March in a leap year. The longitude and latitude of Kolkata are 88° 20' E and 22° 32' N respectively. The standard longitude of IST is 81° 44' E. ***(04)***

1B. Explain the construction and working principle of a sunshine recorder. ***(03)***

1C. Explain the following: solar irradiance, extraterrestrial and terrestrial radiations ***(03)***

2A. Calculate the hour angles at sunrise on 21 June and also on 21 December for a surface collector inclined due south (i.e γ = 0°) at an angle equal to the latitude of the place. The collector is located at Nagpur (21° 06' N, 79° 03' E). Note : (Assume n=171 for June 21 and n= 355 for December 21). ***(04)***

2B. How does sun tracking help in energy collection by a Liquid flat-plate solar collector. Also list the advantages of concentrating collectors over flat plate solar collector? ***(03)***

2C. Explain the functions of various components of Wound rotor Induction generator & Squirrel cage Induction generator in wind turbine system with the help of neat diagrams. ***(03)***

3A. Explain the terms with respect to Wind turbine Airfoil Nomenclature: (i) Drag force (ii) Lift force (iii) Angle of attack & (iv) Chord. ***(03)***

3B. Compare & discuss the floating drum & fixed dome type biogas plants with their neat diagrams. List out its advantages & disadvantages. ***(04)***

3C. Explain the factors affecting the Generation of biogas in the biogas plant. ***(03)***

4A. Compare & discuss the working principle of Up Draught & Down Draught gasifiers with neat diagrams. ***(03)***

4B. Design the volume of the cow dung-based biogas plant required for cooking need of a family of 5 adults and lighting needs with 2, 100 CP lamps for 3 hours daily. Also calculate the required number of cows to feed the plant. Assume standard values of data where required. ***(03)***

4C. Compare & discuss the power generation using Flash steam open systems & Binary Cycle System in Geothermal power plant with the help of neat diagrams. List out environmental related problems in geothermal power plants. ***(04)***

5A. Describe the working principle of Hybrid OTEC power plant with a neat diagram which combines the best feature and avoids the worst feature of the open and closed cycle systems. List out the advantages & disadvantages of OTEC systems. ***(04)***

5B. Compare Double basin linked basin plants. & Double basin paired basin tidal power plants with neat diagrams. ***(03)***

5C. For a proposed tidal site, the height between high and low water tide is 10 m. The basin area is about 0.55 Sq km which can generate power for 5 hours in each cycle. The average available head is assumed to be 9.5 m and overall efficiency of the generation is 75 percent. Assume density of sea water as 1025 kg/m2. Total no of tidal cycle in a year =705. ***(03)***