Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE-UP EXAMINATIONS, JUNE 2018

SUBJECT: RENEWABLE ENERGY [ELE 4024]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 20 June 2018** **Max. Marks: 50**

Instructions to Candidates:

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

1A. Define the terms: (a) Altitude angle, (b) Angle of Incidence, (c) Solar Azimuth angle, (d) Declination angle. ***(04)***

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

1C. Calculate the hour angles at sunrise on 21 June and also on 21 December for a surface collector inclined due south (i.e $\gamma = 0°$) 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). ***(03)***

2A. Derive the current and voltage expressions of an equivalent circuit of a practical solar PV cell under STCs. ***(02)***

2B. Explain the following Electrical Energy Storage systems in detail.

a) Flywheels

b) Compressed Air Energy Storage

c) Superconducting Magnetic Energy Storage

d) Capacitors ***(08)***

3A. Explain the operation and main features of Wind-Diesel hybrid generating systems with a neat diagram. ***(03)***

3B. Explain Double output Induction generator and AC-DC-AC link variable speed constant frequency wind energy conversion schemes with neat sketches ***(04)***

3C. Using Betz model of a wind turbine, derive the expression for power extracted from wind. ***(03)***

4A. Explain Gasification method of Biomass conversion process with a neat diagram ***(03)***

4B. Explain anaerobic digestion method of Bio-Chemical conversion process with a neat diagram ***(03)***

4C. Explain Circulating Fluidized and Bubbling Fluidized Bed Gasifiers with a neat diagram. ***(04)***

5A. What is OTEC? Explain OTEC working principle and with a neat diagram explain the working of Closed or Anderson OTEC technology. ***(05)***

5B. i) Explain the main components of a tidal power plant.

ii) Explain Linked-basin tidal-energy conversion scheme with a neat sketch. ***(05)***