Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **M .TECH**
P2HTCC12

2nd Semester Regular Examination – 2016-17
RENEWABLE ENERGY SYSTEMS
Branch: HEAT POWER &THERMAL ENGG, HEAT POWER ENGG, THERMAL ENGG
Time: 3 Hours
Max Marks: 100
Q.CODDE:Z979

Answer Question No.1 which is compulsory and any four from the rest.
The figures in the right hand margin indicate marks

Q1 **Answer the following questions:** **(2 x 10)**

a) What are the instruments used for measuring solar radiation and sunshine?
b) Define PV effect.
c) Why orientation is needed in concentrating type collectors?
d) Draw the equivalent circuit for solar PV panel.
e) What is meant by pitch angle in wind energy system?
f) What are the spring and neap tides?
g) Draw a g graph showing the voltage for a typical low temperature, air pressure, fuel cell.
h) Calculate the number of daylight hours in Bhubaneswar on May 19 (Longitude of Bhubaneswar is 85.84° and standard longitude is 82.84°).
i) Calculate the fill factor for a solar cell which has the following parameters:
V_{oc}=0.24 V, I_{sc}=-9 mA, V_{max}=0.14 V, I_{max}=-3 mA
j) Determine the available power output from wind turbine when
Blade length= 52m, wind speed=12m/s, air density= 1.23kg.m^3 and power coefficient is 0.4.

Q2 **a)** Explain how ocean tides are generated and how the power can be tapped? Discuss the limitations of this method. **(10)**
b) Describe the construction and principle of operation of a turbine used for tidal power. **(10)**

Q3 **a)** What is a fuel cell? Describe the principle of working of a fuel cell with reference to H_2O_2 cell. **(10)**
b) Principle of geothermal energy conversion technique. Explain with sketch **(10)**

Q4 **a)** What is the principle of solar photovoltaic power generation? What are the main elements of a PV system? Explain the different characteristics of PV system. **(10)**

b) Explain with a neat diagram the working of various types of wind generators. **(10)**

Q5 **a)** Explain the principle of conversion of solar energy into heat. What are the main components of a flat plate solar collector, explain the function of each? **(10)**

b) Calculate top loss coefficient for an absorber with a single glass cover having the following specifications: **(10)**
Plate-to-cover spacing =30 mm
Plate emittance = 0.4
Ambient air= 30°C
Wind heat transfer coefficient= 15 W/m^2°C
Mean plate temperature=100°C
Collector tilt =21°
Glass emittance =0.9

Q6 **a)** What are the instruments used for measuring solar radiation and sunshine? Describe one with sketch. **(10)**
Estimate the monthly average daily global radiation on a horizontal surface at Bhubaneswar (20.2700° N, 85.8400° E) during the month January if the average sunshine hours per day is 8.5.

b) Briefly explain different kind of concentrating collectors used for power generation applications. **(10)**

Q7 **Write short notes on (any two)** **(10x2)**

a) Desalination using Solar Energy
b) OTEC
c) Sensible and latent heat storage methods