Registration No. : | | | | | | | | | | |

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**B. Tech**

**PEEL 5302**

# Fifth Semester Back Examination – 2014

## RENEWABLE ENERGY SYSTEMS

## BRANCH(S) : EEE, ELECTRICAL

**QUESTION CODE : L 276**

**Full Marks – 70**

**Time : 3 Hours**



*Answer Question No. **1** which is compulsory and any **five** from the rest.*

*The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2×10

(a) Define the conversion efficiency of a solar cell.

(b) What is greenhouse effect ?

(c) What is the principal biomass resources used for energy extraction ?

(d) What are the instruments used for measurement of solar radiation ?

(e) What is solar time and why it is different from standard clock time of a country ?

(f) Calculate the number of sunshine hours in Delhi on January 1 and July 1. The latitude of Delhi is 28,61° N.

(g) What are the major advantages of solar photovoltaic system over conventional power systems ?

(h) Calculate the open circuit voltage of a silicon cell at 48°C if short circuit current and reverse saturation current are given as 2A and 10nA respectively.

**P.T.O.**

(i) What is furling speed region ?

(j) What do you mean by anaerobic digestion ?

2 (a) What is the status of non-conventional energy sources in India and what are their future prospects ? 5

(b) Discuss the various types of pollutants and their harmful effect on surroundings. 5



3 (a) Explain how the variation of insolation and temperature affects the I-V characteristics of solar cell. 5

(b) The following data were measured for a HAWT : 5

Speed of wind = 20 m/sec at 1 atm and 27°C

Diameter of rotor = 80 m, Speed of rotor = 40 rpm

Calculate the torque produced at the shaft for maximum output of turbine.

4. With the help of a neat diagram explain the working of MSW incineration plant. 10

5. (a) A PV system feeds a dc motor to produce 1 hp power at the shaft. The motor efficiency is 85%. Each module has 72 multi-crystalline silicon solar cells arranged in a 10 × 6 matrix. The cell size is 156 mm × 156mm and the cell efficiency is 15.4%. Calculate the number of modules required in the PV array. Assuming global radiation incident normally to the panel is 1000 $W/m^2$. 5

(b) Explain with suitable diagram the operation of stand-alone Solar PV system. 5

6. (a) What is the effect of partial or complete shadowing of a cell in a module ? 5

(b) What is the importance of MPPT (maximum power point tracking) in a solar PV system ? Explain. 5

7. (a) A HAWT is installed at a location having free wind velocity of 15 m/s. The 80 meter diameter rotor has three blades attached to the hub. Find the rotational speed of the turbine for optimal energy extraction. 5

(b) Explain the speed control strategies for wind turbine. 5

8. Write short notes on any **two** of the following : 5×2

(a) Pyranometer

(b) Grid tied solar PV system

(c) Hybrid PV-Wind energy system

(d) Aerodynamics operation in a wind turbine.