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| Seat<br>No. |  |
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**B.E. (Electrical) (Semester – VII) (New Course) Examination, 2010  
RENEWABLE ENERGY SOURCES**

Day and Date : Thursday, 2-12-2010  
Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions:* 1) Attempt any three questions from each Section.  
2) Draw neat sketches wherever necessary.  
3) Figure to right indicates full marks.

SECTION – I

1. a) Write a note on various sources of renewable energy. 10  
b) State the factors driving growth of renewable energy supply. 8
2. a) Derive an expression for power extracted from the wind and explain different terms in this expression. 8  
b) For a wind speed of 10 m/s at standard atmospheric pressure, calculate power produced by a turbine of 100 m diameter. The efficiency is 40% and air density is 1.225 Kg/M<sup>3</sup>. 8
3. a) Write a note on : 8
  - i) Upwind and downwind wind-turbine generator system
  - ii) Vertical and Horizontal axis wind-turbine generator systems.
- b) The diameter of wind turbine operating at 5 rpm with efficiency of 40% is 10 m. The wind speed under standard atmospheric condition is 10 m/s. Calculate power output of wind turbine in kW and axial thrust in N. 8
4. a) Explain the working of direct-connect synchronous machine used for wind power generation. 8  
b) Explain the working of fixed speed direct-connect induction generator. 8

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SECTION – II

5. a) Derive time domain model for wind turbine drive-train system. **8**  
b) Derive the steady state model of constant speed induction generator. **8**
6. a) Using the schematic explain the working of doubly-fed induction generator. **8**  
b) Explain the variable rotor-resistance control of wind turbine generator. **8**
7. a) Explain following terms : **8**  
i) Voltage flicker  
ii) Weak Grid  
iii) Stiff Grid  
iv) Short-circuit power of grid and short circuit ratio.
- b) State the causes of harmonics in wind farm based power system network. **8**
8. a) Derive an equivalent electrical circuit and an expression for output current for PV module. **9**  
b) Draw and explain i-v and p-v Curves of PV module. **9**
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