Time: 3 Hrs **Marks: 80**

Note: - 1. Question No. 1 is compulsory
2. Attempt any three questions out of remaining five questions
3. Assume suitable data if necessary & justify the same
4. Figures to the right indicates marks

Qu.1 Attempt **any Four**.

(a) Describe the principle and operation of Wave energy. **[5]**

(b) Differentiate between Horizontal axis and Vertical axis wind turbine system. **[5]**

(c) Illustrate the working of Liquid flat plate collector. **[5]**

(d) Give brief review of various sources of renewable energy. Describe the energy scenario of India **[5]**

(e) Draw the single diode model of solar cell. Also sketch the solar PV cell I-V & P-V characteristics and label it. Define the following terms (1) Open circuit voltage in solar cell. (2) Short circuit current in solar cell. (3) Fill factor (4) Efficiency of solar cell **[5]**

Qu.2 (a) Discuss any one power electronic topology for renewable energy application **[10]**

(b) Analyze the impact of change in solar radiation and temperature on solar PV characteristics with a neat diagram. **[10]**

Qu.3 (a) Illustrate the significance of MPPT in a PV system. Distinguish between mechanical and electrical means of MPPT. Explain any one MPPT algorithm with the help of suitable diagram. **[10]**

(b) Illustrate the Power Converters for Doubly Fed Induction Generators (DFIG) in Wind Turbines **[10]**

Qu.4 (a) Describe the working of a wind power system and its components with a neat schematic diagram. **[10]**

(b) With a neat diagram, explain the working of Solar air heater. **[10]**

Qu.5 (a) What are the different types of fuel cells available? Compare the features of any three fuel cells with neat diagram. **[10]**

(b) With a neat diagram, explain the solar pond and write any one advantage of it. **[10]**

Qu.6 (a) State the effect of the following on solar PV system performance i) Mismatch in modules ii) Hot spots in the modules iii) Bypass diode. **[10]**

(b) What is geothermal energy? Explain the working principle of a geothermal power plant with the help of a neat sketch **[10]**

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