

N.B.

1. Question No.1 is Compulsory.
2. Answer any three out of remaining five questions
3. Assume any suitable data wherever necessary and justify the same
4. Illustrate answer with sketches wherever required

- Q 1 a Illustrate the term distributed generation. What are the issues towards integrating DG with the grid? **5**
- b What is the C-rating of battery? A battery is rated as 100 Ah at 5C. Will the available capacity be different if it is discharged at 1C? Explain. **5**
- c What are the different ways to use solar thermal energy? Describe any one of them in brief with the help of neat diagram. **5**
- d Illustrate the advantages and disadvantages of a horizontal axis wind turbine (HAWT). **5**
- Q 2 a What are types of fuel cell? Explain in detail fuel cell which can be molded in different shapes **10**
- b State the effect of the following on solar PV system performance **10**
- i) Mismatch in modules ii) Hot spots in the modules
- iii) Bypass diode iv) Blocking diode
- Q 3 a Explain the principles of the following technologies: **10**
- i) Tidal energy ii) Biomass based power generation
- b Illustrate the financial benefits of energy storage systems in detail. **10**
- Q 4 a Draw I-V (current v/s voltage) characteristics of a 315Wp solar PV panel with $V_{mp} = 36V$ and $I_{mp} = 8.75A$ at **7**
- i) $1000 W/m^2$ ii) $600 W/m^2$. Clearly mark all essential parameters on characteristics. Also calculate peak power at $400 W/m^2$.
- b Draw neatly equivalent circuit of solar PV cell. Also list out the terms used in the equivalent circuit of solar cell. **3**
- c Draw the power topology of wind energy system (WES) based on Doubly Fed Induction Generator (DFIG) and SCIG. Also compare their advantages and disadvantages. **10**
- Q 5 a Illustrate the significance of MPPT in PV system. Distinguish between mechanical and electrical means of MPPT. Explain Perturb and Observe MPPT algorithm with the help of suitable diagram. **10**
- b Illustrate the term Power Coefficient, Tip Speed ratio of a wind turbine **05**
- c What are the advantages and disadvantages of Fuel cell-based power generation in comparison with solar PV based power generation **05**

Q 6

Write a short note on **any four**

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- a) Pumped hydro energy storage system
 - b) Distributed MPPT
 - c) Comparison of mono-crystalline and poly-crystalline solar cell
 - d) Flywheel as an energy storage device
 - e) Application of ultra-capacitor and battery in electric vehicle
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