

73

(3Hrs)

Total Marks: 80

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

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|-----|---|--|----|
| 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**

20

- 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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