

N.B.

1. Question No.1 is Compulsory

2. Answer any three out of remaining five questions
3. Assume any suitable data wherever required, justify the same
4. Illustrate answer with sketches wherever required

- Q.1 a) State and compare various renewable energy sources. What is the possibility of mitigating the problem faced due to fossil fuels with the integration of renewable energy? **05**
- b) List out the solar PV technologies. Illustrate anyone in brief. **05**
- c) Describe the working principle of a tidal energy power generation **05**
- d) What are the different ways to use solar thermal energy? Describe any one of them in brief with the help of neat diagram. **05**
- Q.2 a) Describe the principle of operation of Proton Exchange Membrane Fuel Cell (PEMFC) along with its electrical characteristics. Illustrate how PEMFC can fed power to three phase AC standalone load. **10**
- b) Illustrate the financial benefits of energy storage systems in detail. **10**
- Q.3 a) Explain the following technologies: **10**
- i) Wave energy ii) Pumped hydro storage system
- b) Illustrate the concept of Maximum power point tracking (MPPT) in solar PV system? Illustrate the P&O MPPT algorithm. What precautions should be taken when using MPPT system? **10**
- Q.4 a) Draw I-V (current v/s voltage) and P-V (power v/s voltage) characteristics of a solar PV cell and clearly mark all essential parameters on it. What is the impact of change in solar radiation and temperature on solar PV characteristics? **10**
- b) Explain the working of a Wind Energy System (WES) with its various components. What are the different power converter topologies used for WES? Explain anyone in detail. **10**
- Q.5 a) State and explain following parameters related to batteries: **10**
- i) State of charge (SOC)
- ii) Depth of discharge (DOD)
- iii) Battery Capacity
- iv) C-Rating
- b) Illustrate the principle of Aerodynamics in relation with Wind turbine operation **05**
- c) Illustrate the phenomenon of Hot Spots in PV module. **05**
- Q 6 Write short notes on: **20**
- a) Solid Oxide Fuel Cell
- b) Distributed Generation
- c) Necessity of energy storage for PV system
- d) Electric Vehicle operation