**PS7004**

**SOLAR AND ENERGY STORAGE SYSTEMS**

**UNIT – I**

**INTRODUCTION**

**2 MARKS**

1 . What is wave particle duality?

2 . What is black body and black body radiation?

3 . Write max-plank equation.

4 . What are direct(beam) , diffuse radiation and global radiation?

5.What is forbidden energy gap?

6 . Define air mass.

7 . What is greenhouse effect? Name the greenhouse gases

8 . Define insolation or solar irradiance

9 . What is sunshine hours (or duration ) ?

10 . What is typical meterological (TMY) data?

11 . Define clearness index .

12 . What are the types of semiconductor material ?

13 . Write the standard economic cash flow equation.

14 . Define fill factor.

15 . Define declination angle .

16 . What is mismatch losses ?

17 . What are the reasons for optical losses?

18 . What is hot spot heating ?

19.Define spectral responsivity.

20.Define solar constant.

21.Define carrier lifetime of a material.

22.Define carrier diffusion length.

**16 MARKS**

1. Explain about the direct and diffuse radiation.(8m)

2.Estimate the solar insolation data.

3.Explain about the extraterrestrial and terrestrial radiation falling on horizontal surface.

4.Estimate the global and diffuse components.

5.Estimate radiation falling on tilted surface.

6.Briefly explain the bond and band model.(8m)

7.How is light absorbed in a semiconductor? Also write notes on recombination of e-h pairs. (8m)

8.How a pn junction is formed? And explain its characteristics (8m)

9.What is the effect of light,temperature and parasitic resistance on a solar cell?

10.Briefly explain the spectral response of solar cell. (8m)

11.Explain about the optical and recombination losses.

12.Explain the hot-spot heating

**UNIT II**

**STAND-ALONE PV SYSTEMS**

**2 MARKS**

1.What is the use of blocking diode?

2.Why regulator is needed in a PV system?

3.What is regulator set point?

4.What are the requirements for inverters used in stand-alone PV systems?

5.What materials are used in mounting structures?

6.Define system availability.

7.What is meant by hybrid system?

8.What parameters are required to determine the load?

9.What is sizing?

10.Write the requirements for battery to be used for long term.

11.What is coulombic or charge efficiency?

12.What is voltage efficiency?

13.What is energy efficiency?

14.Define power rating of battery.

15.Define battery capacity.

16.What is depth-of-discharge?

17.What are super capacitors?

18.Draw the block diagram of standalone PV system.

19.What are the reasons for encapsulated cell have lower efficiency?

20.What is earthing or grounding?

**16MARKS**

1.Explain about the regulators used in PV system. .(8m)

2. Explain about the inverters used in PV system. .(8m)

3.What are the protection methods employed for PV system? Explain in detail.

4.Explain briefly about sizing. .(8m)

5.Explain in detail about the energy storage systems.

**UNIT III**

**GRID CONNECTED PV SYSTEMS**

**2 MARKS**

1.What are the issues to be considered when selecting an inverter?

2.What is Islanding?

3.What are technical issues involved in large, central-generating PV plant?

 4. What are economic issues involved in large, central-generating PV plant?

5.What are the benefits of ‘Sunshine Projects’ in Japan?

6. What are the benefits of ‘PV Rooftop Program’ in Australia?

7.What is energy credit?

8.What is capacity credit?

9.What are the two modes of grid connected PV system?

10.Write the difference between stand-alone and grid-connected PV system.

11.What are the essential components for a household system?

12.What is the need for grid-interactive inverter and metering equipment?

13 How can you prevent array arching?

14.What is array arching?

15. What are the various approaches to rooftop mounted PV arrays?

**16 MARKS**

1.Write notes on onsite storage .(8m)

2.Explain about any three international PV programs.

3.Explain in detail about the PV systems in buildings.

4.What are the design issues for central power stations. Explain in detail.

5.Write in detail about the utility application for photovoltaic.(8m)

6.Explain in detail about the efficiency and performance of PV cell.

7.Explain about the PV programs in USA and China.

**UNIT IV**

**ENERGY STORAGE SYSTEMS**

**2 MARKS**

1.What is the overall efficiency of pumped storage?

2.What are the advantages of pumped hydroelectric energy storage?

3.What is sensible heat storage?

4. What is latent heat storage?

5. What are the disadvantages of pumped hydroelectric energy storage?

6. What are the advantages of solar thermal energy storage?

7. What are the disadvantages of solar thermal energy storage?

**16 MARKS**

1.Explain in detail about the solar thermal energy storage.

2. Explain in detail about the battery energy storage.

3. Explain in detail about the pumped hydroelectric energy storage.

4.Write notes on impact of intermittent generation.

5.Explain in detail about sensible heat storage.

6.Explain in detail about latent heat storage.

**UNIT V**

**APPLICATIONS**

**2 MARKS**

1.What are the important factors to be considered while designing a solar car?

2.Why there is delay in the practical use of solar car?

3.What is meant by direct –driven PV cell?

4.Mention some applications of direct-driven PV cell.

5.What is radiation hardness?

 6.What is transportable PV power supplies?

7.What are the disadvantages of photovoltaic powered systems?

8.What are the benefits of solar water pumping?

9.What are the disadvantages of solar water pumping?

**16 MARKS**

1.Explain how a photovoltaic system is used for telecommunication.

2. Explain in detail about solar cars.

3.Explain in detail about direct-drive applications.

4.Explain how PV cell is used in space.

5.Explain in detail about solar water pumping.

6.Explain in detail about the battery chargers.