

Total No. of Questions : 10]

SEAT No. :

**P3277**

**[5670]-546**

[Total No. of Pages : 2

**B.E. (Mechanical)**

**SOLAR AND WIND ENERGY**

**(2015 Pattern) (Semester - II) (Elective - IV) (402050B) (End Sem.)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Draw suitable neat diagrams, wherever necessary.
- 3) Figures to right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if required.

**Q1)** a) Define Surface Azimuth angle, Zenith angle, Inclination angle with figures. **[6]**

b) Explain parabolic dish collector with figure. **[4]**

OR

**Q2)** a) Estimate solar radiation data on tilted surface. **[6]**

b) Explain solar air heater with figure. **[4]**

**Q3)** a) Classify solar thermal collectors and Describe Evacuated tube collector with the help of suitable diagram. **[6]**

b) Define fill factor and maximum power. **[4]**

OR

**Q4)** a) Classify solar concentrating collectors and explain line and point concentrator with figure. **[6]**

b) Explain Grid aspect of solar system. **[4]**

**Q5)** Design 200 lit. solar water heating system by using flat plate collector using following data. **[18]**

Daily average solar radiation is 750 W/m<sup>2</sup>

Effective daily sunshine hours are 6 hrs.

Inlet and outlet water temperature is 22°C and 45°C

The tilt angle of flat plate collector system is 45° to horizontal

Calculate the efficiency of the system.

OR

**P.T.O.**

- Q6)** Design a solar PV system wherein load consists of a CFL, TV, Fan, Refrigerator and Computer. The system should allow the use of loads in non sunshine hours. The operating hours and the power rating of these loads are given in following table. [18]

Load	Watts	Number	Watt-hr
CFL	9	10	90
Fan	60	8	480
TV(21")	150	2	300
Refrigerator	150	8	1200
Computer	250	3	750
Total daily Watt-hr/day			2820

- Q7)** a) Describe with neat sketch the working of wind energy system (WECS) with main components. [8]  
 b) Describe main considerations in selecting a site for wind generators. [8]

OR

- Q8)** a) Derive an expression for power developed due to wind. [8]  
 b) Explain various design considerations for horizontal and vertical axis wind turbines. [8]

- Q9)** A propeller type turbine has a following data [16]  
 Speed of free wind at a height of 10m = 12 m/sec.  
 $\alpha = 0.14$   
 Air density = 1.226 kg/m<sup>3</sup>  
 Height of tower = 100m  
 Diameter of rotor = 80m  
 Wind velocity at turbine reduces by 20%  
 Generator efficiency = 85%  
 Find total power available to wind, power extracted by wind turbine, electrical power generated, axial thrust on turbine, maximum axial thrust on turbine.

OR

- Q10)** a) Explain in detail step by step design process for miniature wind mill. [8]  
 b) Explain status of wind energy potential and installation in India. [8]

