

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/m²

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/m³

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]
