

Ganpat University
B.Tech Semester VIII (ME) C.B.C.S.Regular Examination May 2014
Subject: 2ME801 Alternative Energy Sources

Time: 3 Hours

Total Marks: 70

Instruction:

1. All questions are compulsory
2. Answers of two sections must be written in separate answer sheet
3. Assume suitable data if necessary
4. Figure to the right indicates full marks

Section I

- Que.1. (a)** Explain the following term on basics of solar radiation geometry (6)
- (i) Latitude Angle
 - (ii) Surface azimuth angle
 - (iii) Hour angle
- (b)** Estimate the monthly average daily global radiation on a horizontal surface at Vadodara (22° N, 73° 10' E) during the month of April if the average sunshine hours per day is 9.5. (6)

OR

- Que.1. (a)** Calculate the monthly average hourly radiation falling on a flat plate collector facing south orientation with a slop of 17° , given the following data (6)
- Location: Vadodara (22° N, 73° 10' E)
Month: October
Time: 1100 – 1200 h (LAT)
Global radiation: $2408 \text{ kJ/m}^2\text{-h}$
Diffuse radiation: $1073 \text{ kJ/m}^2\text{-h}$
Assume ground reflectivity to be 0.2

- (b)** Find the temperature of the sun's surface if it is assumed to be black and the value of the solar constant is 1367 W/m^2 . (6)

- Que.2. (a)** Plot the variation of τ_r , τ_a , and τ , with the angle of incidence 30° and 90° (7)
for the following cover system
Material glass
Number of covers = 2
Thickness of each cover = 4
Refractive index of glass relative to air = 1.2
Extinction coefficient of glass 15 m^{-1}

- (b)** Explain the direct solar water heating system with neat sketch. (5)

OR

- Que.2. (a)** Explain the factor effecting on performance of concentrating collectors (7)
- (i) Orientation of collector with tracking mode
 - (ii) Effect of mass flow rate
 - (iii) Effect of inlet temperature
- (b)** A compound parabolic collector, 1 m long, has an acceptance angle of (5)

200. The absorber surface of the collector is flat and has a width of 10 cm calculate the concentration ratio, the aperture, the height and the surface area of the concentrator.

- Que.3. (a) Explain the difference between renewable and non renewable sources of energy (4)
 (b) Explain about different instruments used for measuring solar radiation (4)
 (c) Explain the working principal of solar pond (3)

Section II

- Que.4 (a) Discuss about different types of wave energy conversion devices. (6)
 (b) Discuss about the various application of solar photovoltaic system (6)

OR

- Que.4 (a) Briefly explain site selection consideration for wind energy conversion system. (6)
 (b) Calculate the energy content of the wind per square meter for the following situation: (6)

Location: Madvi, Gujarat

Month: May

Height above ground: 10.9 m, take $\rho = 1.20 \text{ kg/m}^3$

- Que.5 A village consisting of 98 families, each family consisting of 5 persons (adults). Village survey report gives the following information's about cattle (12)

Cattle	No of cattle in village	Dry mass Kg/per day
Cows	102	10
Oxes	124	12
Buffalo	52	15
Pig	2	2

A community biogas plant is to be designed only for cooking and house lighting with following conditions

Gas required for cooking /person/day = 0.227 m^3

Gas required for lighting 100 C.P. lamp per hour = 0.126 m^3

Each family is allotted One lamp which would burn 2 hours daily

Density of slurry = 1090 kg/m^3

Calorific value of the biogas /cu m = 4713 kcal

OR

- Que.5. (a) Explain the principle of MHD power generation. Also give the application of MHD generators. (6)
 (b) Describe the Tidal power generation scheme. (6)

- Que.6. (a) Give the classification of bio-gas plant and explain any one with neat sketch (4)
 (b) Discuss about different type of wind turbines also compare their performance (4)
 (c) Explain the term economic evaluation of installing a solar energy system. (3)

End of paper