## SECTION—B

6. (a) Explain the constructional details and working of 'KVIC' digester. 6

   (b) What do you mean by thermal gasification ? Give the classification of gasifier and constructional details of it. 7

7. (a) What are the various problems associated with biogas plant ? 6

   (b) Derive an expression for maximum power developed by a wind mill. 7

8. (a) A wind turbine has rotor diameter of 15 m. The wind speed of 7 m/s. Assume normal temperature and pressure of air. Energy utilization factor is 0.72, efficiency of WIG unit is 33%. Calculate the electrical power delivered. 7

   (b) Explain the binary cycle system for liquid dominated geothermal system. 6

9. (a) Explain the working of open cycle MHD generator. 7

   (b) Explain open cycle OTEC system of power generation from ocean with representation on T-S diagram. 6

10. Write short notes on any **Three** :— 14

    (i) Double basin Tidal power generation

    (ii) Wave energy conversion devices

    (iii) Savonius Rotor

    (iv) Petrothermal Systems.









**Faculty of Engineering & Technology**

**Eighth Semester B.E. (Mech. Engg.)/Eighth Semester B.E.P.T. (Mech.) Examination**

# RENEWABLE ENERGY SYSTEMS

**Elective—III**

**Sections—A & B**

Time : Three Hours] [Maximum Marks : 80

## INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section A and **THREE** questions from Section B.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

(5) Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeraton charts is permitted.

## SECTION—A

1. (a) What are the instruments for measuring solar radiation and sunshine ? Explain the working of pyranometer for measuring global radiation with neat sketch. 7

   (b) Calculate the angle made by beam radiation with the normal to flat-plate collector on Dec. 1 at 09 : 00 hr. (local apparent time). The collector is located in New Delhi, is tilted at an angle of 36° with the horizontal and is pointing due south. New Delhi (28° 35'N, 77° 12'E). 6

2. Following data relates to solar radiation on tilted surfaces :

   Location : Nagpur (21° 06'N, 79° 03'E)

   Slope of collector : 30°

   Data : 30 January

   Time : 09 : 00 A.M. (LAT)

   Reflectivity for concrete/glass surface = 0.2

   Constant A = 1228 W/m², B = 0.142

   C = 0.058

   Beam radiation in the direction of the rays :

$$I_{bn} = A \times e\left(\frac{-B}{\cos\theta}\right); \quad I_d = C \times I_{bn}$$

   Surface is south facing.





http://www.rtmnuonline.com

   Determine :

   (i) Tilt factor for beam radiation ($R_b$).

   (ii) Tilt factor for diffuser radiation ($R_d$).

   (iii) Tilt factor for reflected radiation ($R_r$).

   (iv) Flux on tilted surface in W/m² ($I_t$). 13

3. (a) Explain the construction of flat plate collector. Discuss various factors on which performance of flat plate collector depends. 7

   (b) What are the various merits and demerits of concentrating collector over flat plate type of collector. 6

4. (a) Enumerate the different types of concetrating type collectors. Describe a collector used in power plant for generation of electrical energy. 7

   (b) Find Transmissivity–Absorptivity product for the following data :

   Material = glass

   Number of covers = 3

   Thickness of each cover = 4 mm.

   Refractive index of glass = 1.52 ($n_1/n_2$)

   Extinction coefficient of glass = 15 $m^{-1}$

   Angle of incidence of beam radiation = 15°

   $S_d$ = 0.24 for three glass covers

   Absorptivity of plate $\alpha$ = 0.95. 7

5. Write short notes on any **Three** :—

   (i) Paraboloid collectors

   (ii) Fresnel lens

   (iii) Solar pond

   (iv) Solar furnace. 13