



- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Diagrams and chemical equations should be given whenever necessary.
  11. Illustrate your answers whenever necessary with the help of neat sketches.
  12. Use of non programmable calculator is permitted.

1. a) Define the terms with suitable sketches : 6
    - i) Incident angle.
    - ii) Hour angle.
    - iii) Declination angle.
  
  - b) Estimate the monthly average of daily global radiation and diffused radiations on a horizontal surface at Nagpur (21.5 °N, 79 °E) in the month of March, if the average sunshine hours per day are 9.5. Assume March 16 as a reference day for the calculation. Also assume  $a = 0.28$  and  $b = 0.48$ . 8
- OR**
2. a) What are the instruments for measuring solar radiation and sunshine? Explain the working of pyranometer for measuring global radiation with neat sketch. 6
  - b) Calculate the sunset hour angle and day length of a location latitude of 40 °N on June 21. 4
  - c) Define solar constant. What is its importance in solar energy utilization. 4
3. a) Explain the construction of flat plate collector Discuss various factors on which performance of flat plate collector depends. 7
  - b) Define collector efficiency factor of flat plate collector. What are the various factors considered in estimating collector efficiency factor? 6
- OR**
4. a) Calculate angle of incidence of beam radiation on flat plate collector for the following situation : 8  
 Location – 21 °N; 79 °E  
 Slope of collector = 30°  
 Date = December 1  
 Time = 09 am. (IST).  
 Collector is pointing due south.
  - b) Explain construction of working of liquid flat plate collector with neat sketch. 5

5. a) Describe the working principle of solar furnace with neat sketch. 6  
b) What are the various merits and demerits of concentrating collector over flat plate type of collector. 7

**OR**

6. a) Explain working of solar pond with suitable diagram. 6  
b) What is the principle of solar photovoltaic power generation ? What are the main elements of a. P.V-system. 7
7. a) Explain the construction details and working of KVIC type Biogas plant with neat sketch. 7  
b) Describe with neat sketch, updraft gasifier. 6

**OR**

8. a) How can biogas be used as a fuel in I.C. Engine ? Explain the working of such engine with neat sketch. 7  
b) Explain gasifier with its classification. What is pyrolysis. 6
9. a) Explain various components of wind energy conversion system. 7  
b) Describe the 'close cycle' ocean thermal electric conversion systems with its advantages over open cycle. 6

**OR**

10. a) Describe the main consideration in selecting a site for wind generation. 6  
b) Explain single basin tidal power plant. 7
11. a) Explain vapour dominated geothermal power plant with neat sketch. 7  
b) Explain the working of open cycle MHD power generation with neat sketch. 7

**OR**

12. a) Describe the liquid dominated flashed steam system for geothermal energy. 7  
b) Describe MHD close cycle system (Inert gas) with its advantages and disadvantages. 7

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