

Time : 3 hours



Marks : 80

- N. B. 1) Question No. 1 is compulsory  
 2) Attempt any three questions out of remaining five questions  
 3) Figures to right indicate full marks  
 4) Assume suitable data if necessary
- Q. 1. Write short note on any four 20  
 a) Define Solar Constant, Air Mass, Solar Altitude Angle, Angle of Incidence  
 b) Wind Energy Site Selection  
 c) Energy Audit  
 d) Energy Plantation  
 e) Classification of Energy Sources
- Q. 2. a) Calculate Solar altitude angle, incident angle and collector efficiency if: 10  
 Location, Pune : ( $18^{\circ} 32'N$ ,  $73^{\circ} 51'E$ )  
 Day and Time: May 15, 11A.M.  
 Annual average intensity of solar radiation  $400 \text{ W/m}^2$   
 Collector tilt: Latitude angle  
 No. of glass covers: 2  
 Heat removal factor: 0.85  
 Transmittance of glass: 0.88  
 Absorptance of glass: 0.90  
 Top loss coefficient:  $7 \text{ W/m}^2 \text{ }^{\circ}\text{C}$   
 Collector fluid temperature:  $73^{\circ}\text{C}$   
 Ambient temperature:  $28^{\circ}\text{C}$   
 Diffusive reflectance for two covers: 0.24
- Q. 2 b) Explain the construction details and working of KVIC biogas digester 10
- Q. 3. a) Explain the techniques suggested for maintaining the Biogas production. 10
- Q. 3. b) Estimate monthly average total daily radiation on FPC facing south, at Mumbai ( $19^{\circ} 07'N$ ,  $72^{\circ} 51'E$ ) during the month of March, if the average sunshine hours per day is 9.5. Assume the value of  $a = 0.31$  and  $b = 0.43$  10
- Q. 4. a) State various parameters which affects performance of solar collectors 04
- Q. 4. b) What is wave energy? Explain any one wave energy conversion system 06
- Q. 4. c) Calculate the number of animals and volume of biodigester required to produce power for household which has power requirement of 0.8 KW for lighting and cooking purpose. 10  
 Take C.V. of methane  $28 \text{ MJ/m}^3$   
 Burner efficiency: 65%  
 Retention period: 25 days  
 Dry matter per animal per day is 1.8 kg  
 Density of dry matter in slurry in digester is  $50 \text{ kg/m}^3$   
 Biogas yield is  $0.3 \text{ m}^3$  per kg of dry input  
 Methane proportion in biogas is 0.7

- Q. 5. a) State and explain design considerations in Wind turbine design 08
- Q. 5. b) Describe 'Closed Cycle' OTEC system with its advantages over 'Open Cycle' system. 06
- Q. 5. c) State the advantages and disadvantages of geothermal energy 06
- Q. 6. Write short note on any Four 20
- a) Small head hydro power development
  - b) Application of Wind Energy
  - c) Producer Gas
  - d) Total Energy Conversion
  - e) Fuel Cell

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