

Duration: 3hrs

[Max Marks:80]

- N.B. :** (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]**
- a Explain the working of Solar Pond. **5**
 - b Explain various types of Fuel Cells. **5**
 - c Discuss the advantages & disadvantages of Geothermal energy **5**
 - d Explain OTEC system **5**
 - e What are the various types of biogas generation plants. **5**
- 2 a Define and explain the followings:- [5]**
- (a) Latitude (b) Hour angle (c) Declination
- b State The various types of solar PV cells [5]**
- c Calculate the variation at day length OVER A YEAR (on 26Th of the month of year 2022) of the following location and plot the same on graph. & make your comments. Location: Mumbai (19.076⁰N,72.877⁰E) [10]**
- 3 a Discuss in brief, what are the effects of various parameters on the performance of flat plate collector. [10]**
- b Calculate the angle made by beam radiation with the normal to a flat plate collector on December 1, at 9.00 A.M., solar time for a location at 28° 35' N. The collector is tilted at an angle of latitude plus 10°, with the horizontal and is pointing due south. [10]**
- 4 a Explain The Various Methods to improve the efficiency of PV cells. [10]**
- b State The working principle of a solar PV system. [10]**

- 5 a Wind at 1 standard atmospheric pressure & 15⁰c has a velocity of 15m/s [10]
calculate, 1) the total power density in the wind 2) a maximum obtainable power density 3) the total power 4) the total torque & axial thrust. (Given data Turbine dia.=120M, turbine operating speed =40 RPM at max. efficiency assume propeller type wind turbine)
- b Discuss in details, the various Factors for selection of sites for wind mills. [10]
- 6 a The following data are given for a family biogas digester suitable for the output of 5 cows; the retention time is 20 days, temp. is 20⁰c, dry matter consumed per day =2kg. Biogas yield is 0.24m³/kg, the efficiency of burner is 60%, methane proportion is 0.8, heat of combustion of methane=28MJ/m³, calculate 1) the volume of Digester & 2) power available from digester. [10]
- b For a Rs. 12 lacs investment in solar energy equipment which meets 54 % of annual load of 160 GJ. If first year fuel cost is Rs. 750 per GJ and expected to inflate at the rate of 11 % per year. Determine [10]
- (a) Undiscounted payback time.
- (b) Discounted payback time if the discount future cost is at rate 8 %.
