

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – IV • EXAMINATION – SUMMER • 2014****Subject code: 743901****Date: 04-06-2014****Subject Name: Solar and Photovoltaics****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define angle of incidence of beam radiation. Calculate angle of incidence of beam radiation on a surface located at Glasgow (56° N, 4° W) at 10 a.m. on 1 February, if the surface is oriented 20° east of south and tilted at 40° to the horizontal. Civil time in Glasgow winter is GMT. **07**
- (b) Define the following term: (i) Declination angle (ii) Altitude Angle **07**
(iii) Hour Angle (iv) Zenith Angle (v) Solar Constant (vi) Beam Radiation
(vii) Global Radiation
- Q.2** (a) Explain with neat sketch working of Pyranometer? **07**
- (b) Calculate the Apparent Solar Time (AST) on March 10, 2014 at 2:30 pm for the city of Athens Greece (Longitude 23° 40' E). Standard meridian for local time zone = 30° E. **07**
- OR**
- (b) Find the solar altitude and azimuth angles at 2 hr after local noon on June 15, 2014 for a city located at 40° N latitude. Also find sunrise and sunset hours and the day length. **07**
- Q.3** (a) Explain design considerations for flat plate collectors. **07**
- (b) Why orientation and sun tracking systems are required for focusing collector systems. Explain different orientation and sun tracking systems. **07**
- OR**
- Q.3** (a) State the main component of flat plate collector? Explain the working of a liquid flat plate collector. **07**
- (b) With neat sketch explain the working of solar pond. **07**
- Q.4** (a) List factor influencing the design of solar PV array. Explain any TWO. **07**
- (b) Explain focusing or concentrating collectors. Also write their advantages and disadvantages over flat plate collector. **07**
- OR**
- Q.4** (a) List the applications of solar energy. Calculate the solar power required to raise temperature of water in a 1000-litre tank by 15 °C. Assume 6 peak sun hours in a day. (Specific heat of water = 1.16 kWh/°C /m³) **07**
- (b) List different losses associated with solar flat plate collector. Explain any TWO. **07**
- Q.5** (a) Write short note on Tower Power Plants with central receiver system. **07**
- (b) Define fill-factor and efficiency of a PV cell. Also explain merits and limitations of solar cells. **07**
- OR**
- Q.5** (a) Explain construction of photo voltaic cell with neat sketch. Determine capacity of a solar PV panel required to supply power to an electric motor, connected to a pump, for delivering 2000 litres of water per day at a height of 12 meters. There are 5 hours of good insolation over a day. Efficiency of pump, motor and PV panel is 90% each. **07**
- (b) Explain different energy storage systems. **07**
