Seat No.: _____ Enrolment No._____

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 (56º N, 4º W) at 10 a.m. on 1 February, if the surface is oriented 20º east of south and tilted at 40º to the horizontal. Civil time in Glasgow winter is GMT.	**07**
	(b)	Define the following term: (i) Declination angle (ii) Altitude Angle (iii) Hour Angle (iv) Zenith Angle (v) Solar Constant (vi) Beam Radiation (vii) Global Radiation	**07**
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 23º 40ô E). Standard meridian for local time zone = 30º 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 40º 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 óorientation and sun trackingô systems are required for focusing collector systems. Explain different óorientation and sun trackingô 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 /m^3)	**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 ófill-factorô and óefficiencyô 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**

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