



End Semester Examination – Nov/Dec – 2016

Code : 14ME3035

Sub. Name : Solar Thermal Energy Conversion

Semester : 2016-17 ODD

Duration : 3hrs

Max. marks : 100

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Calculate the transmittance, reflectance and absorptance of a single glass cover 2.4 mm thick at an angle of 62° . The extinction coefficient of the glass is 34 m^{-1} and the refractive index of the glass is 1.527.	CO1	14
	b.	Discuss the working of the instrument used for measuring the Sunshine Duration.	CO1	6
(OR)				
2.	a.	Find the Solar declination, Solar time and Equation of Time (ET) for Coimbatore on September 8. The latitude and longitude values of Coimbatore are 11.02° N , 76.97° E . Take local time as 11:00AM.	CO1	8
	b.	With neat diagram, explain the construction and working principle of Pyranometer.	CO1	8
	c.	Discuss the need for selective surface coating on solar collectors?	CO1	4
3.	a.	With neat diagram, discuss the following terms: i. Terrestrial Solar Radiation ii. Extra-terrestrial Solar Radiation iii. Beam Radiation iv. Diffuse Radiation	CO1	12
	b.	Illustrate the radiative properties and characteristics of materials with help of first law of thermodynamics.	CO1	8
(OR)				
4.	a.	Calculate the top loss coefficient for an absorber with a single glass cover having the following specifications: Plate-to-cover spacing = 17mm Plate emittance = 0.94 Ambient air and sky temperature = 13°C Wind heat transfer coefficient = $13 \text{ W/m}^2\text{C}$ Mean plate temperature = 104°C Collector tilt = 44° Glass emittance = 0.87	CO2	10
	b.	Define the term area concentration ratio and with help of schematic diagram and obtain the maximum concentration ratio of circular concentrators.	CO2	10
5.	a.	Briefly discuss the role of Phase Change Materials in thermal energy storage system.	CO3	10
	b.	In thermal energy storage system, explain the concept chemical energy storage and list down the applications.	CO3	10
(OR)				
6.	a.	In a home, there are seven persons, the hot water demand is 110litres /person and the average solar radiation in that latitude is 560 W/m^2 . The ambient temperature is 29°C and the inlet water temperature is 2°C less than the	CO4	15

		ambient temperature. Required outlet temperature of water it should be 53°C. Calculate the area of solar collector to meet the required demand and cost of the solar collector area if the per square meter cost is Rs.578/-.		
	b.	List down the primary types of Solar Concentrating collectors.	CO2	5
7.	a.	With neat diagram, explain the direct circulation water heating system with inclusion of storage tank.	CO4	10
	b.	Discuss the concept of solar desalination and explain the techniques involved to achieve desalination.	CO4	10
(OR)				
8.	a.	With help of neat block diagram, explain the absorption air conditioning system in solar refrigeration.	CO4	20
		<u>Compulsory:</u>		
9.	a.	With help of neat diagram, explain the Solar Electric Generating System under parallel operation with the source of solar and natural gas.	CO4	15
	b.	Discuss the practical difficulties for usage of solar furnace in solar thermal applications.	CO4	5

ALL THE BEST