Total number of printed pages: 2 **Programme(PG)/1st Sem/PGET103**

2022

Fundamentals of Energy Technology

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What is solar collector?	5
	b)	Write the classification of solar collector?	5
	c)	A long steel rod of 2.65 cm diameter is to be heated from 380° C to 640° C It is placed concentrically in a long cylindrical furnace which has an inside diameter of 20 cm. Inner surface of the furnace is at a temperature of 1050° C and has an emissivity of 0.9. The surface of the rod has an emissivity of 0.54, calculate the average rate of heat absorption during the heating process.	10
2.	a)	Write about the energy scenario in India.	5
	b)	Derive the total power contained in the wind flowing through the swept area A.	5
	c)	Calculate the total wind power in an area where the average wind speed is 6 m/s, using a wind power plant with a 60 meter rotor diameter. Assume air temperature is 25 degree centigrade with a density of 1.225 kg/m^3.	10
3.	a)	What is air mass? When is air mass minimum.	5
	b)	Derive the expression for transmissivity based on absorption when beam radiation is inclined at certain angle.	5
	c)	A flat plate collector is made up of an aluminium absorber plate with aluminium tubes fastened underside of the absorber plate. Two glass covers are also placed above the absorber plate. The following data are available: Refractive index of glass relative to air = 1.53, Angle of incidence = 35°, Thickness of each cover = 6 mm. Extinction coefficient of glass= 15 per meter. Calculate the transmissivity of the glass cover.	10
4.	a)	What is irradiance?	5
	b)	Calculate approximate declination angle on June 21.	5
	c)	Calculate the daylight hours in Guwahati on January 1st and July 1st for a non leap year. Consider the latitude of Guwahati as 26.15 degree North.	10
5.	a)	Define daily diffuse solar radiation and daily global solar radiation.	5

	b)	Calculate the hour angle(in radian) at sunrise.	5
	c)	During the month of October at 1100-1200 hours (LAT), solar radiation incident was observed at Chennai ($13^{o}00'N$) on a flat plate collector facing south ($\gamma = 0$) with a slope of 15^{o}. Consider the mean global radiation and the mean diffused radiation incident on the inclined surface to be 2408 kilo Joule per sq. meter per hour and 1073 kilo Joule per sq. meter per hour respectively. Assume the ground reflectivity to be 0.2. The representative day is 15th October. Calculate the (i) Tilt factor for beam radiation (ii) Tilt factor for diffuse radiation (iii) Tilt factor for reflected radiation (iv) Monthly average hourly radiation (in kilo Joule per sq. meter hour) falling on the flat plate collector	10
6.	a)	What is surface azimuth angle.	5
	b)	Suppose the cost of electricity is Rs. 5/KWhr. Calculate the total cost of electricity for running 15 LED bulbs of capacity 18 watt for 15 days.	5
	c)	Calculate the hour angle at 1400 hrs.	5
	d)	A 25 MW rated power plant is running at its full capacity. Calculate the electricity generation per year in KWhr.	5