GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2181910   **Date: 02/11/2017**
Subject Name: Renewable Energy Engineering
Time:02:30 PM TO 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 terms : Angle of Incidence, Declination, Solar constant	**03**
	(b)	List the advantage and limitation of Renewable Energy.	**04**
	(c)	Explain construction and working of Pyranometer with schematic diagram.	**07**
Q.2	**(a)**	The latitude of Srinagar is 34^0. Find day length in hrs. When sunlight is available on 1st July.	**03**
	(b)	Explain working of solar still with neat sketch.	**04**
	(c)	A compound parabolic collector has an acceptance angle of 22^0. The absorber surface of the collector is flat and its width is 12 cm. Find out the followings: (i) Concentration ratio of a collector (ii) The width of aperture and height of collector (iii) Surface area of the concentrator taking length of the collector = 1m.	**07**

OR

	(c)	A cylinder parabolic collector having 2.5 cm width and 10 m long is used to heat fluid entering at 150 ^{0}C with a flow rate of 7.5 kg/min (C_{pf} = 1.25 kJ/kg ^{0}C . The diameter of the absorber tube is 6.5 cm which is covered with glass tube. Take following data: Solar intensity = 700 W/m^2 Atmosphere temperature = 30 ^{0}C Product of absorptivity and transmissivity of absorbing surface for radiation $(\alpha\tau)_{ab}$ = 0.8, Reflectivity of radiation (r_r) = 0.93, Transmissivity of glass (τ_g) = 0.85. Also take collector efficiency factor = 0.85, Heat lost coefficient = 8W/m^2 ^{0}C. Heat transfer coefficient inside the tube is 1 and tilt factor is also 1. Find: 1. Useful heat gain and exit temperature of the fluid. 2. Collector efficiency.	**07**
Q.3	**(a)**	List the basic component of wind mill and draw the wind energy conservation system.	**03**
	(b)	Explain importance of drag and lift force in wind power generation.	**04**
	(c)	Describe the effect of different parameter on the power generating capacity of wind mill. Also explain control mechanism of a wind turbine.	**07**

OR

Q.3	**(a)**	Distinguish between Fixed dome plant and floating dome type biomass plant.	**03**
	(b)	Explain upward draft gasifier with diagram.	**04**
	(c)	Prove that the maximum turbine output can be achieved when $V_e = V_i/3$, Where V_i and V_e are upstream and downstream velocities of the wind.	**07**

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Q.4	**(a)**	List the factors affecting for the performance of flat plate collector.	**03**
	(b)	Explain working of solar pond.	**04**
	(c)	List the geothermal resources. Explain binary fluid hydrothermal system.	**07**

OR

Q.4	**(a)**	Define term: Solar Azimuth Angle, Solar Altitude Angle, Hour Angle	**03**
	(b)	Explain single basin, two-way tidal power plant.	**04**
	(c)	State the principle of Ocean Thermal Energy Conversion (OTEC). Explain working of closed cycle OTEC system.	**07**
Q.5	**(a)**	List the need for economic analysis of renewable energy system.	**03**
	(b)	A proposed insulation system for a house to be heated is expected to save fuel cost of Rs. 2000 in first year. The fuel prices are expected to increase by Rs. 20% per year and best alternative investment with yield 10% per year. Find the total saving from this proposed system expressed in current value. Take life of the system is 15 years.	**04**
	(c)	State the objectives of clean development mechanism. Explain clean development mechanism project cycle with flow diagram.	**07**

OR

Q.5 **(a)** Compute the annual cost of a solar energy system with the characteristics tabulated below. **03**

Factor	Specification
Expected system lifetime t (Yr.)	20
Discount rate (%)	8
Collector area A_c (m^2)	20
Collector cost (Rs/ m^2)	100
Storage cost (Rs/ m^2)	6.25
Cost of control system (Rs.)	100
Miscellaneous cost (Rs.)	200+(5 A_c)
Capital recovery factor for 20 years at 8 %	0.102

(b) Explain basic principle of Magneto Hydro Dynamic generation. **04**

(c) A solar PV system consisting with two lamps, a battery and other associated components cost Rs. 55000. The cost of conventional energy saved due to its installation is Rs. 4000 in the first year and this cost inflates at the rate of 5 % per year. Assume discounting rate is 9%. Calculate the payback period of the system with and without discounting. **07**

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