

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII (NEW) - EXAMINATION – SUMMER 2018

Subject Code: 2181910

Date: 04/05/2018

Subject Name: Renewable Energy Engineering

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

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

		MARKS
Q.1	(a) Explain reserves, production and utilization of primary energy sources in India.	03
	(b) Describe the essentiality for exploration of renewable sources of energy.	04
	(c) Write short notes on classification of energy resources. Also explain which type of alternate energy source is the best suitable for rural and agricultural applications and why?	07
Q.2	(a) Define the following terms: (1) Solar Altitude Angle (2) Declination Angle (2) Hour Angle	03
	(b) Write short note on effect of various parameters on performance of flat plate collectors.	04
	(c) The following data refers to liquid flat plate collector, Collector tilt = 22.15°, Available radiation = 1100 W/m ² , Absorber plate area = 2.1 m ² , Plate emissivity = 0.12, Glass cover emissivity = 0.88, Number of covers = 2, Mean plate temperature = 68° C, Flux available at absorber plate = 800 W/m ² , Side loss coefficient = 0.8 W/m ² -K, Bottom loss coefficient = 0.6 W/m ² -K, Inlet water temperature = 30° C, Ambient air temperature = 25° C, Wind speed = 1.8 m/s, Mass flow rate of water = 62 kg/hr. Determine, (1) Overall heat loss coefficient, (2) Outlet water temperature from the collector (3) Efficiency of collector. Use Test et al. Correlation. Take area of collector is 10% more than area of absorber plate	07
	OR	
	(c) A cylinder parabolic collector having 2.5 m width and 10 m long is used to heat fluid entering at 150 °C with a flow rate of 7.5 kg/min (C _{pf} = 1.25 kJ/kg °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 °C, Product of absorptivity and transmissivity of absorbing surface for radiation ($\alpha\tau$) _{ab} = 0.8, Reflectivity of radiation (ρ_r) = 0.93, Transmissivity of glass (τ_g) = 0.85. Also take collector efficiency factor = 0.85, Heat loss coefficient = 8 W/m ² °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) Explain basic operational principles of solar cell.	03
	(b) What are solar ponds? Discuss working of solar pond with help of neat sketch.	04
	(c) Enlist types of solar thermal power plant. Discuss working of solar pond electrical power plant with neat sketch.	07

OR

- Q.3** (a) Explain future prospects of MHD generation. **03**
(b) Define following terms: **04**
(1) Annual savings (2) Cumulative savings
(2) Life cycle savings (4) Payback period.
(c) The following table shows the various angle of attack, lift and drag coefficient for airfoil DUV400. Find the design angle of attack. **07**

Angle of attack	2	4.1	6.2	8.1	10.2	11.3	12.1	13.2	14.2	15.3
Lift coefficient	0.3	0.54	0.79	0.9	0.93	0.92	0.95	0.99	1.01	1.02
Drag coefficient $\times 10^{-2}$	1.16	1.44	1.46	1.62	2.74	3.03	3.69	5.09	6.48	7.76

Calculate lift and drag force per unit length of blade for the following data. Design wind speed = 10 m/sec Atmospheric pressure = 1.01bar Chord length = 15 cm. Atmospheric temperature = 30oC

- Q.4** (a) Write short note on Magnus effect. **03**
(b) Explain importance of drag and lift force in wind power generation. **04**
(c) Derive the one dimensional momentum theory and Beltz's limit for the wind mill. Also state the assumption in theory and draw the variation of pressure and velocity in wind mill. **07**

OR

- Q.4** (a) What is bio mass? Why is it considered as renewable source of energy? **03**
(b) Explain with neat sketch the three stage scheme for methane fermentation. **04**
(c) Describe the working of floating drum type KVIC biogas plant with the help of neat sketch **07**
- Q.5** (a) What is basic principle of ocean thermal energy conversion? **03**
(b) What do you understand by spring and neap tides? How are they caused? **04**
(c) Define term Tidal Range. Explain 'Double basin tidal power plant. **07**

OR

- Q.5** (a) What do you understand by geothermal energy? Give its main application. **03**
(b) Explain with neat sketch the vapour dominated geothermal system. **04**
(c) Explain with neat sketch the basic and working principle of MHD generator. Also compare with conventional power plant. **07**
