Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2712109 **Date: 04/01/2016**

Subject Name: Renewable Energy Engineering

Time:2:30 pm to 5:00 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 with sketch, the following terminologies: **07**
Extraterrestrial radiation, beam radiation, diffuse radiation, total radiation, reflected radiation, ground radiation, albedo, air mass.

(b) What is fuel cell? Classify the Fuel Cell. Explain in detail any one. **07**

Q.2 **(a)** What are various applications of solar PV? Explain working of PV water pump. **07**

(b) Define incidence angle. From the general expression of incidence angle, write expression for (i) vertical surface, (ii) horizontal surface, (iii) vertical surface facing south. The general expression for incidence angle is **07**
$\cos\theta = \sin\delta \sin\phi \sin\beta - \sin\delta \sin\phi \sin\beta \cos\gamma + \cos\delta \cos\phi \cos\beta \cos\omega + \cos\delta \sin\phi \sin\beta \cos\gamma \cos\omega + \cos\delta \sin\beta \sin\gamma \sin\omega$
where, θ is incidence angle, δ is declination angle, ϕ is latitude, β is slope, γ is azimuth angle, ω is hour angle.

OR

(b) Give an overview of India's energy scenario. **07**

Q.3 **(a)** Differentiate (atleast two points): concentrating and non-concentrating collectors, tracking and non-tracking devices, natural and forced circulation in solar collector. **07**

(b) What are the different solar radiation measuring devices? Discuss in detail with neat sketch Pyranometer. **07**

OR

Q.3 **(a)** Summarize various applications of Hydrogen. Explain the hydrogen as alternative fuel for vehicles. What are the disadvantages of using hydrogen as fuel? **07**

(b) What is the basic principle of OTEC? Explain the closed cycle OTEC plant. **07**

Q.4 **(a)** Give one example of solar energy storage applications, solar thermal application and solar power application. Explain with neat sketch, the construction, working and importance of Solar Cooker. **07**

(b) Derive an expression for tidal flow power. Also discuss tidal power range. **07**

OR

Q.4 **(a)** Derive an expression for power generation from waves. **07**
A wave train has a width of 80 km with waves of height 6m. The wavelength is 60m. Calculate the total power in MW. Take density of sea water 1025 kg/m^3.

	(b)	Explain the problems associated to biogas plant and suggest the remedies for the problems.	**07**
Q.5	**(a)**	Define for Wind Energy Conversion: Pitch control, Yaw control, Rated Power, lift, drag, tip speed ratio, Betz limit.	**07**
	(b)	Discuss the site selection criteria for installation of WTGs. What are the environmental aspects of installing WTGs	**07**

OR

Q.5	**(a)**	What is biogas? What is biomass? What are the various forms of biomass? Explain in detail	**07**
	(b)	Discuss in detail: fixed dome type biogas plant.	**07**

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