GUJARAT TECHNOLOGICAL UNIVERSITY
BE- VIth SEMESTER–EXAMINATION – MAY- 2012

Subject code: 161904   **Date: 17/05/2012**
Subject Name: Alternate Energy Sources
Time: 10:30 am – 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.**

Q.1 **(a)** 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**

(b) Explain, what do you understand by energy conservation and its importance? Also discuss some of the strategy used in the process of energy conservation? **07**

Q.2 **(a)** Explain the concept of "Solar Constant" and "Air mass"? What is the variation of solar Constant with time and what is the reason for this variation? **07**

(b) Derive a general equation for flux incident on a solar collector in terms of hourly beam and diffuse radiations, tilt factors, angle of incidence, Zenith angle and absorptivity transmissivity products for beam and diffuse radiations. **07**

OR

(b) Calculate monthly average of Daily Global Solar Radiation on a Horizontal Surface located in Ahmedabad Gujarat state ($22^o.00^'$ N, $73^o.10^'$ E) for the month of April. Average Solar day hours are 10 hrs. Angstrom's constants for Ahmedabad, a = 0.28, b = 0.48 **07**

Q.3 **(a)** How the solar water heating systems are classified? Explain the working of thermo-syphon solar water heating system with the help of a neat sketch. **07**

(b) What are solar ponds? Discuss the working of a solar pond with help of a neat sketch. **07**

OR

Q.3 **(a)** Prove that in case of Horizontal Axis Wind Turbine maximum power can develop when exit velocity = 1/3 of wind velocity and $P_{max} = 8\, \rho A V_i^3 / 27$ **07**

(b) The following data refer to a wind mill of a wind farm in Gujarat. **07**
Average wind speed = 23.5 km/hr
Atmospheric pressure = 1.01 bar
Atmospheric temperature = 30 ^{0}C
Power coefficient = 0.41
Total power output capacity of wind farm = 1 MW
Determine,
(1) Available power density of wind.
(2) Actual power density of wind mill.
(3) Number of wind mills in the farm if the rotor diameter is 25 m.

Q.4 **(a)** State and explain various routes of Biomass energy conversion to other form of energy. **07**

(b) Explain the working principle of Magneto hydrodynamic generator? Also compare with conventional power plants. **07**

OR

Q.4 **(a)** Describe the working of a floating drum type KVIC biogas plant with the help of neat sketch. **07**

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(b) Draw neat sketches of Open and Closed cycle OTEC systems. **04**

(c) What is wave energy? How it can be used for power generation. **03**

Q.5 **(a)** A tidal power plant of single basin type, has a basin area of 25×10^6 m^2. **07** The tide has a range of 10 m. The turbine however, stops operating when the head on it falls below 2 m. Calculate the energy generated in one filling process, in kWh if the turbine generator efficiency is 75 %. Take density of sea water is 1025 kg/m^2.

(b) What is low temperature liquid dominated geothermal resources? How this **07** heat can be utilized for power generation? Also, state the advantages of such a system.

OR

Q.5 **(a)** Explain the working of liquid metal MHD system with help of neat sketch. **07**

(b) What do you understand by "energy management" and "energy audit"? **07** Classify the energy audit and discuss them in brief.

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