

Centre for Rural Development and Technology, IIT Delhi

Name of Course: Rural Energy Systems (RDL722)

Name of Exam: Minor I; Date: 06/02/2019 (05:30–06:30 PM)

Time: 1.0 h

Maximum Marks: 20.0

1. Discuss the rural energy and urban energy systems. Deliberate the basic differences in these two energy systems? 3.0
2. Describe the present energy scenario of India. 2.0
3. Describe the process of anaerobic digestion along with schematic diagram. What are the parameters which have influence on the successful operation of the process? 5.0
4. An anaerobic digester (reactor) is operating on cattle dung in daily feeding mode and is having 1000 L of working volume. The hydraulic retention time (HRT) of the plant is 30 days. Calculate following parameters; (a) Daily feeding rate (daily feed volume), (b) If the total solids (TS) and volatile solids (VS) in the substrate (mixture of dung and water) is 10%, and 8%, respectively, then calculate the daily mass of TS, VS, and water fed to the digester. 5.0
5. Calculate the following parameters for the biogas having 60% methane and 40% carbon dioxide in it. (a) Density of the biogas, (b) Calorific value of biogas, and (c) If the same biogas (1.0 m³) is being used for cooking of food using a gas burner having 65% thermal efficiency, then what would be useful energy (kWh) of the system. 5.0

Handwritten calculations:

$$7 \times 0.6 = 4.2$$
$$\frac{350}{6} = 58.33$$
$$\frac{62 \text{ m}^3}{246} = 0.252$$
$$\frac{246}{246} = 1$$
$$1 \times 4.2 = 4.2$$

Handwritten calculations:

$$\frac{350}{6} = 58.33$$
$$\frac{246}{246} = 1$$
$$\frac{246}{246} = 1$$

at same