Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER – III (New) • EXAMINATION – WINTER - 2020

Subject Code: 3730009   **Date:1/1/2021**
Subject Name: Waste to Energy
Time: 10:30 AM TO 12:30 PM   **Total Marks: 56**
Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Calculate the basic dimensions of a biogas plant for the following data: Number of animals = 1000, Average dung production = 11.50 kg per animal per day, Gas yield = 0.041 m^3/kg of dung, Retention period = 20 days, Roof area factor = 1.07, Roof volume factor = 1.05, Charge density = 970 kg/m^3.	**07**
	(b)	Explain the LBL process for biomass liquefaction with neat layout.	**07**
Q.2	**(a)**	Define physical conversion process for biomass and explain need of physical conversion process. Write a short note on size reduction of biomass.	**07**
	(b)	Write the short note on (i) Industrial waste and (ii) crop residue.	**07**
Q.3	**(a)**	Explain in brief the working of fluidized bed combustors with neat layout.	**07**
	(b)	Explain in detail the design consideration of improved chullahs.	**07**
Q.4	**(a)**	Explain the working of inclined grate type combustor and state the advantages and disadvantages.	**07**
	(b)	Explain in details the conventional process for the manufacturing of charcoal from the biomass.	**07**
Q.5	**(a)**	Explain the working of fixed dome biogas plant with neat diagram and state advantages and disadvantages.	**07**
	(b)	Explain in brief the biodiesel production process from biomass.	**07**
Q.6	**(a)**	Define the fermentation. Explain (i) two stage and (ii) three stage fermentation scheme.	**07**
	(b)	Explain in brief the alcohol production process from biomass.	**07**
Q.7	**(a)**	Explain in brief the kinetic consideration in gasification process.	**08**
	(b)	Explain in brief working of downdraft fixed bed gasifier with neat diagram and state the advantages and disadvantages.	**06**
Q.8	**(a)**	Liquid ethanol (C$_2$H$_5$OH) is burned with 150% theoretical oxygen. The reactants enter at 25°C and the products are cooled and leave at 65°C, 0.1 MPa. Calculate the heat transfer per kmole of fuel. Take enthalpy of formation for ethanol is -277634 kJ / kmole of fuel.	**07**
	(b)	Explain in brief working of fluidized bed gasifier with neat diagram and state the advantages and disadvantages.	**07**

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