Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER IV (NEW) – • EXAMINATION – WINTER 2016

Subject Code: 2743901 **Subject Name: Biomass Energy Conversion** Time:02:30 pm to 05:00 pm

Total Marks: 70

07

Date: 26/10/2016

Instructions:

- 1. Attempt all questions.
- Use of Enthalpy of Formation data book is permissible after verification. 2.
- 3. Make suitable assumptions wherever necessary.
- Liquid Hydrazine (N_2H_4) and oxygen, both at 25^oC and 0.1 MPa, are fed to a **Q.1** 08 (a) rocket combustion chamber in the ratio of 0.5 Kg of O₂ per Kg of N₂H₄. The heat transfer from the chamber to the surrounding is estimated to be 100 kJ/ Kg of N₂H₄. Determine the temperature of the product. Assume that H₂O, H₂ and N₂ present in product of reaction. Enthalpy of formation of liquid Hydrazine is +50,417 kJ per kmole of fuel at 25° C and 0.1 MPa.
 - Determine the basic dimensions of a biogas plant for dairy industry for a given **(b)** 06 data :

Number of animals = 586, Average dung production = 13 Kg per animal per day, Gas yield = 36 liter per Kg of dung, Retention period = 24 days, roof area factor = 1.067, Roof volume factor = 1.043, Charge density = 950 Kg/m^3 .

- Q.2 Using principle of mass conservation, find the combustion reaction for the kelp 07 (a) lot:- RK-1 (C_{2.17}H_{3.65}O_{1.25}) react with 115% theoretical air. Calculate the Airfuel ratio on mole basis and mass basis. Also do the product analysis on mass basis, dry and wet basis.
 - Explain the two stage and three stage scheme of fermentation process with neat 07 **(b)** layout of process.

OR

Define Anaerobic digestion. Explain in brief biochemistry and microbiology of **(b)** 07 Methanogenesis.

Q.3	(a)	Define physical conversion process. Write a short note on Densification.	07
	(b)	Explain in brief processes involved in energy farm installation.	07

OR

- Q.3 Why biomass is considered as modern energy carrier? Give reasons. 07 **(a)** 07
 - Write a short note on Municipal solid waste. **(b)**
- Define pyrolysis. Describe pyrolysis process and explain in brief process steps 07 **Q.4 (a)** involve in slow pyrolysis process.
 - Explain Entrained gasifier with neat and clean sketch. Also discuss advantages 07 **(b)** and disadvantages.

OR

- Define combustion. Describe combustion process and explain in brief process **Q.4 (a)** 07 steps involve in combustion process.
 - Explain in brief downstream processing for the liquefaction process. **(b)**

- Q.5 (a) Define biochemical conversion process. Write short note on Methenogens. 07
 - (b) Explain in brief feedstock preparation process for soluble sugar with neat 07 layout.

OR

- Q.5 (a) Define fermentation. Explain in brief factors considered for the selection of site 07 for biogas plant.
 - (b) Explain in brief continuous ethanol fermentation process with neat layout. 07
