

**Prince of Songkla University**  
**Faculty of Engineering**

**Final Examination**

**22 February 2010**

**215-665 ENERGY FROM BIOMASS AND CONVERSION**

**Semester 2/2552**

**Time 09:00-12:00**

**Room: Robot**

**Directions**

- Closed book examination
- All types of calculator and dictionary are permitted.
- Attempt all 5 questions.
- The exam paper has 8 pages.

**Juntakan Taweekun**  
**Instructor**

<b>Problem</b>	<b>Marks</b>	
1	14	
2	20	
3	20	
4	15	
5	20	
<b>Total</b>	<b>89</b>	

Name \_\_\_\_\_

ID \_\_\_\_\_

Name \_\_\_\_\_ ID \_\_\_\_\_

**Question 1 (14 points)**

Explain the meaning of the following words

1.1 Gas Engine

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1.2 Biogas

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1.3 Gasification

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1.4 Synchronous Generator

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1.5 Nonmethanogenic Bacteria

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1.6 Methanogenic Bacteria

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1.7 Homoacetogenic Bacteria

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Name \_\_\_\_\_ ID \_\_\_\_\_

**Question 2 (20 points)**

2.1 Explain the methods for dust cleaning in details. Also show the advantages and disadvantages for each method.

2.2 Explain the methods for NO<sub>x</sub> in details.

Name \_\_\_\_\_ ID \_\_\_\_\_

**Question 3 (20 points)**

The followings are details for floating drum design:

Item	Details	Values
1	Amount of manure	3,000 kg/day
2	Ratio of amount of manure and digester volume	5.7 kg/0.075 m <sup>3</sup>
3	Detention period	60 day
4	Cylindrical Shaped digester - Thick - Ratio of diameter and height	0.125 m 1:1.25
5	Amount of required biogas	120 m <sup>3</sup> /day
6	Coldest ambient temperature	17 °C
7	Surrounding temperature of digester	22 °C
8	Inside temperature of digester	35 °C
9	Thermal conductivity of material for gas holder	3.25 kJ/(hr.m <sup>2</sup> .°C)
10	Thermal conductivity of material for digester (floor, area between digester and gas holder)	2.5 kJ/(hr.m <sup>2</sup> .°C)

Calculate

- 3.1 Digester volume, diameter and height of digester.
- 3.2 Gas holder volume, diameter and height of gas holder.
- 3.3 Heat loss from digester and gas holder (in unit of kJ/day)

Name \_\_\_\_\_ ID \_\_\_\_\_

**Question 4 (15 points)**

There are different types of gasifiers. How many types of gasifier? Explain and draw each type in details. Also explain various zones in each type of gasifier.

Name \_\_\_\_\_ ID \_\_\_\_\_

**Question 5 (20 points)**

5.1 Explain Biogas producing factors in details. (10 points)

Name \_\_\_\_\_ ID \_\_\_\_\_

5.2 Explain methods for biogas purification in details. (10 points)