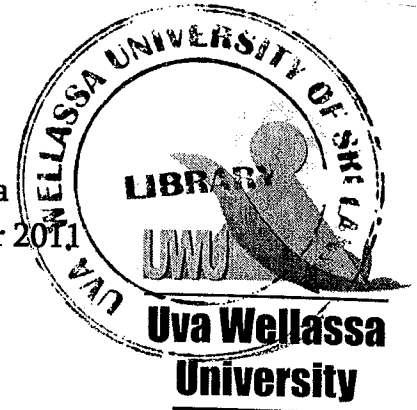


Uva Wellassa University, Sri Lanka  
End Semester Examination – September 2011  
SCT 425-2 Biomass Conversion



Time: Two (02) hours

Total Five (05) Questions

Answer only Four (04) questions including the question number One (01).

1.

a.

- i. Discuss the advantages and disadvantages of wind mill power generation for countries like Sri Lanka.

(10 marks)

- ii. A leading Sri Lankan company decided to establish a new wind power unit near Hambanthota. Before the construction, they visited the location and estimated the parameters of the air. They found that the wind speed varies according to the weather pattern of that location. Therefore they measured the wind speed weekly over two month period and the data are given below. Calculate the mean power that can be generated from this unit. ( Density of the air  $2.5\text{g/dm}^3$ , Diameter of the area that the rotor swept 2m)

Weeks of the period	Wind speed (km/h)
1	55
2	70
3	50
4	60
5	75
6	45
7	80
8	80

(10 marks)

b. "Kalupahana" is a small village in Uva province which lacks of a proper electricity generation. According to the records, the village is in a high sensitive area which consists of untouched natural water streams.

i. Considering the nature of the area, discuss a method to generate electricity for this village. (use suitable diagrams)

(12 marks)

ii. What are the drawbacks of your proposed method to an area like "Kalupahana".

(08 marks)

2.

a. What are the key elements that control biofuel demand and the market?

(05 marks)

b. How does bioethanol reduce CO<sub>2</sub> emissions?

(03 marks)

c. Asian Development Bank decided to grant Rs. 30 million to establish bioethanol production plant from paddy husk in Anuradhapura District. Imagine that you are a one of the coordinators of that project.

i. Propose the best method to produce bioethanol.

(02 marks)

ii. Discuss the major steps involved in your proposed method.

(10 marks)

3. Write short notes on followings

a. Co-current fixed bed gasifiers

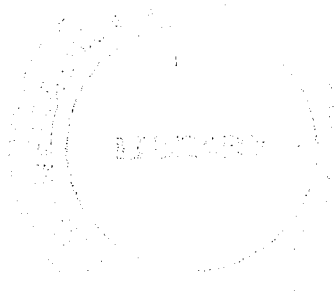
(06 marks)

b. Fluidized bed technology

(06 marks)

c. Dedicated energy crops

(08 marks)



- 4.
- a. What are the major stages of pyrolysis process?  
(05 marks)
  - b. What are the applications of pyrolysis?  
(05 marks)
  - c. A group of university students were asked to design an experiment to find out heating value of a certain fuel sample using bomb calorimeter. Therefore they have obtained 50g of the sample and subjected to the combustion. Assuming that heat of vaporization of water is equal to 2260 kJ/kg, calculate the number of moles of the sample combusted completely during the experiment.  
(Note- The amount of heat required to convert 1kg of a liquid into the vapor without a change in temperature is 2260kJ, The amount of water vaporized = 10 g, The amount of carbon available = 5g)  
(10 marks)

- 5.
- a. How land fill gases make hazardous conditions?  
(03 marks)
  - b. What are the advantages and disadvantages of biogas over wood as a cooking fuel?  
(05 marks)
  - c. Discuss the biogas production process  
(12 marks)