

Roll No: -----



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

**Program:** B.Tech (ET+L)  
**Subject (Course):** Fundamentals of Bio-Energy  
**Course Code :** ETEG315  
**No. of page/s:** 02

**Semester –** V  
**Max. Marks** : 100  
**Duration** : 3 Hrs

### Section - A

5x4 = 20 Marks

1. Mention the types of Biogas Digesters that are officially recognized by MNES (MNRE). (CO2)
2. Define Dielectric Constant and Dielectric Loss Factor. (CO1)
3. Explain about Biomass Briquetting. (CO2)
4. Explain how steam explosion can help in Biomass Pretreatment. (CO4)
5. Explain about Vermicomposting of Biomass. (CO3)

### Section - B

4x10 = 40 Marks

6. Compare Fixed and Floating Drum Biogas Digesters. (CO3)
7. **a)** Mention the names of microbes involved in alcohol Fermentation. (4M) (CO2)  
**b)** It was found that during alcohol fermentation process, the conversion efficiency was 72%. Assuming the initial molasses content of 20 liters, find out the final Ethanol yield. (1 liter = 0.264 gallons) (6M) (CO4)
8. **a)** Mention the advantages of Biomass Gasification process and the calorific value of Producer gas. (5M) (CO3)  
**b)** Explain about substrate requirements for Gasification. (5M) (CO1)
9. Describe Rate Limiting Step. Mention the rate limiting steps of Bio-Gas production. (CO1)

### Section - C

2x20 = 40Marks

10. **a)** Classify Lean and Dense Phase Reactors and Explain about Dense Phase Reactors. (10M) (CO1)  
**b)** Explain the reaction mechanisms involved in Gasification. (10M) (CO2)

**11. a)** 1000kg of Biomass having 13.6% moisture content is subjected to drying in hot air oven @120°C for 24 hrs. After drying it was found that the biomass meets the requirement to be further processed through gasification. Assuming the overall efficiency of the process to be 81.4%, find out the final yield of Producer gas. (15M) (CO4)

**b)** 1m<sup>3</sup> of Biogas is equivalent to (in terms of energy), (5M) (CO4)

1. \_\_\_\_\_ Oil
2. \_\_\_\_\_ Charcoal
3. \_\_\_\_\_ Firewood

**Or**

**a)** Explain about **1.** Cetane Number **2.** Saponification Value **3.** Iodine Value **4.** Cold Flow Properties **5.** Viscosity. (14M) (CO1)

**b)** Define **1.** Biomass **2.** Bio-Energy **3.** Bio-Diesel. (6M) (CO1)

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**Section - A**

**5x4 = 20 Marks**

1. Explain a) Growth tolerance b) Production tolerance. (CO1)
2. Draw the Flow chart of Glucose to Bio-Ethanol Conversion process. (CO2)
3. Explain about 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> generation Biofuels. (CO3)
4. Mention the composition of Producer Gas and also the technology through which Producer gas can be converted to liquid fuels (Bio-Diesel). (CO2)
5. Explain the importance of Torrefaction. (CO3)

**Section - B**

**4x10 = 40 Marks**

6. Explain about Esterification and Trans-Esterification. (CO2)
7. a) Explain the importance of biomass pretreatment. (CO1)  
b) Explain about Microbiological pretreatment (CO1)
8. a) Compare Batch and Continuous fermentation process. (7M) (CO3)  
b) Mention the theoretical yield of Bio-Ethanol during glucose to alcohol fermentation. (3M) (CO4)
9. Justify which among following types of digesters is better in plant construction and operation
  - a. Fixed Dome
  - b. Floating dome (CO3)

**Section - C**

**2x20 = 40Marks**

10. a) Justify how fluidized bed reactors are better in performance over fixed bed reactors. (8M) (CO1)  
b) Explain about emulsification of vegetable oils and its importance. (5M)(CO1)  
c) During Trans-Esterification Process, the product stream contains spectrum of by-products along with Bio-Diesel. Mention all the components of Product stream and

explain how Bio-diesel can be separated from the mixture.(7M) (CO1)

- 11. a)** Jatropha seeds having 80% oil content are considered for Bio-diesel extraction via Trans-esterification process. After seed crushing and oil extraction, it was found that only 60% of initial oil was extracted. Assuming the TG content of Extracted oil is about 71.9%, find out the stoichiometric product yields of Biodiesel and Glycerol. (15M) (CO4)
- b)** For the data given above, mention the quantity of Alcohol required if two times the stoichiometric requirement of alcohol has to be used. (5M) (CO4)

**Or**

- a)** Mention the Testing Standard for quantifying the quality of Bio-diesel. (2M) (CO1)
- b)** Explain the steps involved in converting Biomass to Biogas. Also define **a)** Facultative anaerobes **b)** Obligate Aerobes (18M) (CO2)