KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agrl. Engg.) 2019 Admission
V Semester Final Examination-January 2022

Fpme.3111 **Bio-Energy Systems: Design and Applications (1+1)** **Marks: 50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. Currently the position of India is _____ in total greenhouse gas emission.
2. Agriculture is essentially an energy conversion process in which _____ energy is converted to _____ energy.
3. The name of yeast used in alcohol fermentation is _____.
4. The calorific value of biogas is approximately _____ MJ.
5. The combustible constituents of biogas are _____.
6. _____ is the optimum pH range for biogas production.
7. Hydraulic loading rate is the _____ per unit volume of digester per day.
8. Proximate analysis gives _____ of biomass.
9. _____ process is required before fermentation to produce ethyl alcohol from starch.
10. Vegetable oils generally have a lower _____ than diesel fuel which is not favourable for their direct use as fuel in diesel engines.

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. Distinguish between pyrolysis and gasification.
2. Name the greenhouse gases produced in MSW dumping sites. How can you avoid the emission of the GHG from MSW dumping sites?
3. Give the chemical equation for transesterification.
4. What are the processes involved for alcohol production from lingo-cellulosic materials?
5. Why alcohol is not a good fuel for diesel engine?
6. What is the difference between HHV and LHV?
7. What is meant by energy plantation? Give the name of one suitable plant/species.

III **Answer ANY FIVE of the following** **(5x4=20)**

1. Explain the classification of biomass energy conversion processes.
2. Explain the working of a fuel cell with the help of a line diagram.
3. Explain the major factors affecting anaerobic digestion process.
4. Explain the modification required in SI and CI engines to run on biogas.
5. What are the different types of anaerobic high rate bioreactors for energy production? Explain any one.
6. Explain the difference between updraft and fluidized bed biomass gasifiers.
7. Explain the briquetting process with the help of a flow diagram.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. Design a floating gas holder type community biogas plant to meet the cooking gas requirement for 12 families if sufficient amount of cow dung is available. Make reasonable assumptions and state them.
2. Explain different phases in the biomass gasification process mentioning the chemical processes.

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