KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2020 Admission
V Semester Final Examination - January 2023

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

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

1. The biomasses may be starch and sugar derived and also nonedible lignocellulose, such as lignin, hemicellulose, and .....
2. .....is one of the ubiquitous organic polymer or polysaccharides comprising 3000 or more glucose units, joined together with (β-1-4) glycosidic bonds.
3. Lignocellulose is broken down into bio-oils and gases during .....
4. ..... is obtained by anaerobic digestion (AD) of organic materials, which occurs inside the anaerobic bio digester.
5. ..... digesters manufacture biogas at a stable pressure with variable volume.
6. ..... process converts carbon monoxide and hydrogen into oils or fuels that can be substituted for petroleum products.
7. Heating value of producer gas is .....MJ/m^3.
8. Fourth-generation biofuels are formed from ....., which have the capacity of high carbon capture for biofuel generation.

Choose the correct answer

9. ..... material should be added in the feed of a biogas plant to increase nitrogen content.
   (a) Lignin
   (b) carbohydrate
   (c) chopped leguminous plants
   (d) night soil
10. Fluidized bed gasifier produces ..... (high/low) Tar and ..... (high/low) particles.

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

1. Classify energy resources based on origin/source.
2. Explain biogas fuel cells.
3. State the fuel properties (energy density, octane rating ignition temperature) of biogas.
4. List and briefly explain different Briquetting methods.
5. Draw a neat sketch of Constant pressure type biogas plant.
6. Explain biomass liquefaction.
7. Hydrogen production by bio-photolysis

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

1. Compare the significance of conventional and non-conventional energy sources.
2. Explain the procedure of biodiesel production from Jatropha seed.
3. A plant produces 1200 litres per day of biogas. Calculate the size of the gas holder and the gas holder capacity for a biogas plant that feeds a constant load during the following periods daily (Assume uniform consumption of gas.):
   From 6.00 to 8.00(2 h)
   From 12.00-14.00 (2h)
   From 19.00-21.00 (2 h)

4. Compare and contrast Floating drum and fixed-dome type plants.
5. With a neat sketch explain the different stages of anaerobic digestor.
6. Explain the chemical reactions involved in bioethanol production from sucrose.
7. Summarize on four generations of biofuel production.

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

1. Explain in detail the ten different operational parameters of a biogas plant.
2. With a neat sketch, explain biomass (Downdraft and updraft) Gasification plant.

****