KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks scored:

Level : B. E.
Year : IV

Course : MEEG 455
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

05 MAR 2019
Date :

SECTION "A"
[10 Q. × 0.5= 5 marks]

Mark [√] for the most appropriate answer (s).

1. What percentage of traditional biomass share is in primary energy consumption of Nepal in 2016?
   a) 70% b) 16% c) 19% d) 88%

2. Floating drum biodigester provides .....gas pressure to the biogas stoves.
   a) constant b) varying
   c) both constant and varying d) unpredictable

3. Low carbon - nitrogen (C:N) ratio could stop anaerobic digestion process due to .....
   a) too acidic b) too alkanine
   c) neither acidic nor alkaline d) unpredictable

4. What chemical reaction makes biodiesel:.....
   a) transesterification b) fermentation c) sublimation d) polymerization

5. What typical catalyst is used to make biodiesel?
   a) Acid catalyst b) platinum c) base catalyst d) ultraviolet light

6. Which of the following is not used to produce Ethanol?
   a) Corn Strach b) Oil Crops c) Cane Sugar d) Beet Sugar

7. Fire tube boilers are those in which
   a) flue gases pass through tubes and water around it
   b) water passes through the tubes and flue gases around it
   c) forced circulation takes place
   d) flue gases and water passes unpredictably

8. ..... is an efficient method for producing energy from biomass.
   a) Composting b) Recycling c) Fermentation d) Regeneration

9. Equivalence ratio is expressed as the ratio of actual fuel-air ratio to .....
   a) Stoichiometric fuel-air ratio b) actual air-fuel ratio
   c) Stoichiometric air-fuel ratio d) actual fuel-air ratio

10. The amount of energy absorbed or released as the component is formed from its stable elements during a steady-flow process at a specified state is .....
a) Enthalpy of combustion
b) Enthalpy of reaction
c) Enthalpy of formation
d) Adiabatic flame temperature

SECTION "B"

[10 Q. × 0.5 = 5 marks]

Fill in the blank(s) with appropriate word(s) or value(s).

11. By 2030 all municipality will have a .....for municipal waste management.

12. Gasification converts..... percentage of the energy in the biomass into energy in the syngas.

13. Torrefaction is performed in the .....oxygen at temperature range of 200 to 350 °C.

14. Higher heating value is the amount of heat released by the unit mass or volume of fuel (initially at 25 °C) once it is combusted and the products have returned to a temperature of .....

15. Time required to heat the fuel to the pyrolysis temperature is much shorter than the characteristic pyrolysis reaction time is known as .....

16. Downdraft gasifier produces typically less than .....% of tar-oils and are widely used for engine operation.

17. Calorific values and density of biogas is .....MJ/m^3 and .....kg/m^3.

18. In order to manage 20 kg of cattle manure considering 40 days of hydraulic retention time and specific biogas production 34 L per kg manure, ...m^3 size of the biogas plant is required.

19. In a fixed dome domestic biodigester, the volume between higher slurry level to lower slurry level in a digester is equal to the volume of .....

20. ..... is a facility that is used to concentrate the methane in biogas to natural gas standards.

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F. M. : 40

SECTION "C"
[5Q × 8 = 40 marks]

Attempt *ALL* questions. Assume suitable data if any is missing.

1. Briefly discuss about global scenario of biomass energy in world energy mix. Show Fuel energy mix of Nepal in 2015 and discuss about your understanding on it. Do you think share of different energy in Nepal's energy mix is satisfactory? If it is not, how can we achieve reasonable energy mix? [2+3+3]

2. Make a brief critical evaluation on Biomass energy strategy of Nepal 2017. Discuss about transesterification process of biodiesel production. [4+4]

3. What is the ten design principle of Improved Cooking Stoves? Discuss about different tests to measure efficiency and performance of Improved Cooking Stoves? [4+4]

4. A farmer needs to manage cattle dung of 200 kg daily (animal dung contains 18% VS) in his farm house located in Chitwan area. He heard about conversion of waste into biogas and fertilizer but has no idea about it. He comes to you for technical advice on biogas technology. Please discuss him briefly about the importance of biochemical process on anaerobic digestion, moreover, you are supposed to provide him calculation of the required plant size, daily water requirement and daily biogas and fertilizer production from his waste. Briefly discuss about the use of SCADA system and its advantages in large biogas plant. [2+4+2]

5. What is Torrefaction. Discuss about downdraft gassifier and its application? One kmol of octane (C_8H_{18}) is burned with air that contains 20 kmol of O_2, as shown in Fig. 15–7. Assuming the products contain only CO_2, H_2O, O_2, and N_2, determine the mole number of each gas in the products and the air–fuel ratio for this combustion process. [1+3+4]