KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks scored:

Level : B.E.
Year : III

Course : MEEG 328
Semester: I

Exam Roll No.:
Registration No.:

Time: 30 mins.

F.M. : 20
Date 06 JUN 2019

SECTION "A"
[10Q. × 1 = 10 marks]

Choose and encircle the most appropriate.

1. The efficiency of various types of solar water collectors' _____ with _____ temperature difference between absorber and ambient.
   a. Decreases, decreasing
   b. Decreases, increasing
   c. Remains same, increasing
   d. Depends upon type of collector

2. Which one of the following best describes or defines Biomass?
   a. Natural gas
   b. Petroleum
   c. Inorganic matter that can be converted to fuel
   d. Organic matter that can be converted to fuel

3. A liquid flat plate collector is usually held tilted in a fixed position, facing _____ if located in the southern hemisphere.
   a. North b. South c. East d. West

4. Which of the following is the biggest source of biogas in rural Nepal?
   a. Kitchen waste b. Leaves c. Cattle dung d. Industrial waste

5. A suitable range of carbon nitrogen (C:N) ratio for methanogenesis is .....
   a. 2-40 b. 4-60 c. 15-30 d. 4-10

6. A thermosyphon system of solar collector requires .....to run.
   a. An electric pump
   b. An electric motor
   c. No electric pump or motor
   d. Compressor

7. In the 1970s there was interest in developing wind power because of .....
   a. An oil crisis
   b. Concern over global warming
   c. Improvements in wind turbine
   d. Low production cost in wind turbine

8. Flow Duration Curve (FDC) is useful for the design of
   a. Solar dryer
   b. Downdraft gassifier
   c. Solar PV
   d. Microhydro power plant

9. A 40 Wp solar PV installed in the area where average solar insolation is 4.5 kWh/m^2.d and considered no effect of temperature variation can generate .....electricity daily.
   a. 200 Wh b. 150 Wh c. 180 Wh d. 175 Wh

10. A typical spacing between turbines in a wind farm in terms of their rotor diameters D is approximately
    a. 4D × 7D b. 2D × 3D c. 10D × 12D d. 15D × 20D

SECTION "B"

[10Q. × 1 = 10 marks]

11. Modern renewable energy supply is approximately _____ of the total primary energy use in Nepal.

12. The typical capacity factor of a wind turbine is _____.

13. The fill factor (FF) is the ratio of _____.

14. Depth of discharge (DOD) is defined as the _____ of the battery capacity that has been discharged.

15. _____ is produced by the Transesterfication process.

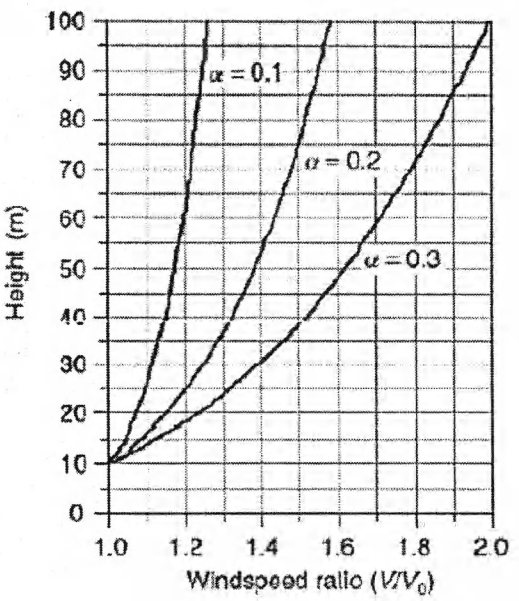
16. The amount of energy available in the wind at any instant is proportional to _____of the wind speed.

17. Time required to heat the fuel to the pyrolysis temperature is longer than the characteristic pyrolysis reaction time is called _____ pyrolysis.

18. The wind velocity is 5 m/s at a height of 10 m above a surface with friction coefficient 0.2, the wind speed at a height of 55 m is _____.

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

20. 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.



KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

06 JUN 2019

Level : B.E.
Year : III
Time : 2 hrs. 30 mins.

Course : MEEG 328
Semester: I
F.M. : 55

SECTION "C"
[5Q. × 11 = 55 marks]

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

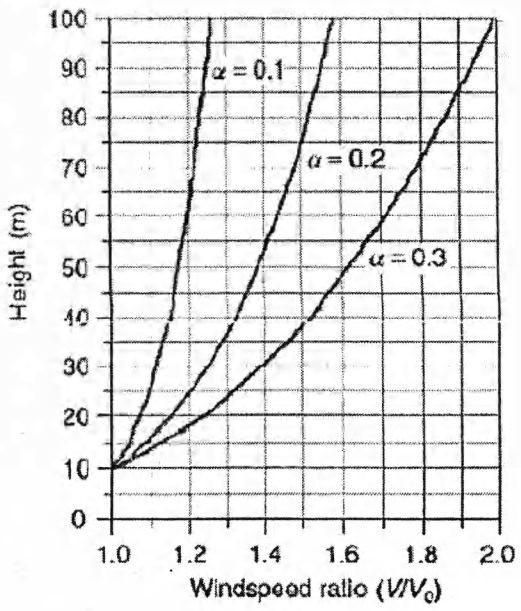
1. What are the 3 generations of solar PV? Describe ideal IV characteristics of solar cell and the influence of temperature and solar radiation changing on it. Estimate the solar PV, charge controller, inverter and battery sizing for AC supply system of off-grid solar PV in a rural household of a single family with the following electric energy requirements. [2+3+6]

Lights in	Power Rating , W	Time used, Hrs
Kitchen (Total)	115	3
Living (Total)	100	4
Bed Room (Total)	140	2
Television	80 W	4
Refrigerator	60 W	2

2. What is anaerobic digestion? How domestic biogas system is relevant for the national development? Discuss briefly about different types of bio digester used in domestic biogas system. Estimate the biogas plant size, daily water requirement and daily biogas and fertilizer production while managing 100 kg/day cattle manure in Morang. [1+3+3+4]

3. What is Improved Cook Stove (ICS)? Briefly explain and show the biofuel production process from waste plastics (Polyethylene, Polypropylene, and Polystyrene etc.) with the help of suitable schematic diagram. Discuss in short about Flow Duration Curve (FDC) and gasification process. [2+5+4]

4. Draw an idealized power curve of the wind turbine and discuss it. A wind turbine is installed at 10 m tower height in Dhulikhel area. The power produced from the turbine is 132 W/m^2 at 15° C and 1 atm pressure. If this turbine tower height increase from 10 m to 80 m then what would be the estimated power production from the same turbine. What important message can be drawn from this calculation? (Assume the terrain of the area is high crops, hedge and shrubs). Briefly discuss about the wind farm. [4+4+3]



5. How do you evaluate the policies and strategies of Nepal's renewable energy development program? Show Fuel energy mix of Nepal and discuss about your understanding on it. In an institution, hot water demand is 1000 l/d at 55 °C where the cold water available is at 15 °C. You are asked to estimate the required area of collector array. Assume the reasonable value for irradiation (or equivalent solar hour) while using collector efficiency is 65% and the overall system efficiency is 85%. [3+4+4]