

KATHMANDU UNIVERSITY  
End-Semester Examinations  
February/March, 2019

Marks scored:

Level : B.E.

Course : MEEG 328

Year : III

Semester: I

Exam Roll No.:

Time: 30 mins.

F.M. : 20

Registration No.:

Date FEB 27 2019

SECTION "A"

[10 Q. × 1 = 10 marks]

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

1. A solar module in a solar panel refers to
  - a) Series arrangement of solar cells
  - b) Parallel arrangements of solar cell
  - c) Series and parallel arrangements of solar cells
  - d) No specific arrangements of solar cell
  
2. What is Zero Net Energy?
  - a) Zero Net Energy means not using any energy.
  - b) Zero Net Energy means not using energy for the internet.
  - c) Zero Net Energy means the total amount of energy used is equal to the amount of renewable energy created on site.
  - d) Zero Net Energy means using a net to try and capture the energy.
  
3. The amount of oil that can be technically recovered at any price is called oil .....
  - a) Reserves
  - b) Reservoirs
  - c) Resources
  - d) Traps
  
4. A typical spacing between turbines in a wind farm in terms of their rotor diameters D is approximately
  - a)  $4D \times 7D$
  - b)  $2D \times 3D$
  - c)  $10D \times 12D$
  - d)  $15D \times 20D$
  
5. The fraction of power in the wind that a modern wind turbine can extract is approximately - .....
  - a) 50-60%
  - b) 40-50%
  - c) 70-80%
  - d) 20-30%
  
6. The collection efficiency of a Flat plate collector can be improved by
  - a) Putting a selective coating on the absorber plate
  - b) Filling the air on the space above the absorber plate
  - c) Removing the glazing of the collector
  - d) Placing horizontally in our geography
  
7. State of Charge (SOC) is defined as the percentage of the battery capacity .....
  - a) Available for discharge
  - b) That has been discharge
  - c) Available for charging
  - d) That has been no use
  
8. Nominal Operating Cell Temperature is conducted at Irradiance ....., Surface temperature of ....., Ambient Temperature of ..... and Wind speed of .....
  - a)  $650 \text{ W/m}^2$ ,  $45^\circ\text{C}$ ,  $20^\circ\text{C}$  and  $2 \text{ m/s}$
  - b)  $1000 \text{ W/m}^2$ ,  $35^\circ\text{C}$ ,  $25^\circ\text{C}$  and  $1 \text{ m/s}$
  - c)  $800 \text{ W/m}^2$ ,  $45^\circ\text{C}$ ,  $20^\circ\text{C}$  and  $1 \text{ m/s}$
  - d)  $800 \text{ W/m}^2$ ,  $35^\circ\text{C}$ ,  $20^\circ\text{C}$  and  $2 \text{ m/s}$

9. The amount of energy available in the wind at any instant is proportional to \_\_\_\_ of the wind speed.
  - a) Square root power of two
  - b) Square root power of three
  - c) Square power
  - d) Cube power
10. Low carbon - nitrogen (C:N) ratio could stop anaerobic digestion process due to .....
  - a) too acidic
  - b) too alkaline
  - c) neither acidic nor alkaline
  - d) unpredictable

SECTION "B"

[10 Q. × 1 = 10 marks]

11. A solar farm is installed in a region where the insolation is 200 kWh m<sup>-2</sup> per month. To produce 1200 kWh of electricity per month, approximate.....m<sup>2</sup> of solar panels with 20% efficiency would be required.
12. Gasification converts.....percentage of the energy in the biomass into energy in the syngas.
13. Fixed dome biodigester provides .....gas pressure to the biogas stoves.
14. In order to manage 30 kg of cattle manure considering 40 days of hydraulic retention time and specific biogas production 34 L per kg manure, the required size of biogas plant is .....?
15. The mean wind speed at site A for a wind farm is 20% higher than at site B. The expected increase in electricity production at site A compared to site B is .....?
16. A feed in tariff guarantees producers of renewable energy a ..... price per unit of supplied electricity.
17. Modern renewable energy supply is approximately ..... of the total primary energy use in Nepal.
18. ....produces typically less than 1% of tar-oils and so are widely used for engine operation.
19. Anaerobic digestion is the decomposition of organic matter in the ..... of air by microorganisms.
20. Time required to heat the fuel to the pyrolysis temperature is much shorter than the characteristic pyrolysis reaction time is called .....pyrolysis.

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F.M. : 55

SECTION "C"

[5 Q. × 11 = 55 marks]

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

1. Discuss about the importance of biochemical process in an anaerobic digestion. A farmer needs to manage cattle dung of 100 kg daily (animal dung contains 16% VS) in his farm house located in Biratnagar, Morang. You are supposed to provide him calculation of the required plant size, daily water requirement and daily biogas and fertilizer production from his waste. Also, suggest him operation and maintenance of biogas plant for efficient operation. [3+6+2]
2. Discuss briefly about three generation of solar photovoltaic (PV). Explain with the help of schematic diagram grid connected and off-grid solar PV system. Estimate the inter row spacing and the total area requirement for the installation of 1 MW grid connected solar PV plant, when solar PV of 315 Wp (length = 1.95 m and breadth = 0.96 m), latitude of installed location is 27° North and the lowest sun inclination to horizontal is 25°. (Take 22 solar panel in each row) [2+4+5]
3. Briefly discuss about the concept of power extraction from wind. Discuss the importance of Weibull distribution and wind rose for wind resource assessment. Briefly discuss the working principle of updraft gasifier with the help of necessary diagram. [3+4+4]
4. Briefly discuss about the vacuum tube solar water heating system with the help of schematic diagram. How do you estimate the efficiency of flat plate solar collector? Hot water demand of a building is 50 L/person/day and an average occupancy of the building is 50 people. The supplied cold water temperature is 20 °C and the hot water temperature at the storage is 55°C. The average solar radiation of the site is 4.5 kWh/m<sup>2</sup>/day. Estimate the collector area requirement for the given demand when system efficiency of the collector is 80% and the collector efficiency is 60%. [3+4+4]
5. Write short notes on [4+3+4]
  - i. Solar Water Pumping System
  - ii. Hydrograph and Flow Duration Curve
  - iii. Renewable energy policies and strategies in Nepal

