KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

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

22 JAN 2024

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

SECTION "B"
[5Q × 11= 55 marks]

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

1. Discuss about the current energy consumption scenario of Nepal. How do you evaluate the current energy systems in terms of energy security of the country? Could you propose necessary actions to be adopted in Nepal's energy systems to attain reliable and sustainable energy systems? [3+4+4]

2. Briefly discuss about the biochemical process and its importance in an anaerobic digestion process. A farmer in Panchkhal, Kavre needs to manage cattle dung of 50 kg daily (animal dung contains 20% TS) in his farm house. You are supposed to advise him the required plant size, daily water requirement and daily biogas and fertilizer production from his cow dung. Also, suggest him why biogas cooking is better than traditional solid biomass cooking in terms of health and environment. [3+5+3]

3. Describe ideal IV characteristics of solar cell and the effect of temperature on it. 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 315Wp (length = 2 m and breadth = 1 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]

4. Briefly discuss about the flat plate 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 40 L/person/day and an average occupancy of the building is 10 people. The supplied cold-water temperature is 10 °C and the hot water temperature at the storage is 55°C. The average solar radiation of the site is 4 kWh/m^2/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: [4Q × 2.75 =11]
   a. Wind Resource Assessment
   b. Power extraction from Wind
   c. Hydrograph and Flow duration curve
   d. Downdraft Gassifier

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Registration No.:

Date :

SECTION "A"
[20Q. × 1 =20 marks]

Choose and encircle the most appropriate option from each set of choices.

1. The mean wind speed at site A for a wind farm is 10% higher than at site B. What would be the expected increase in electricity production at site A compared to site B?
   a. 10% b. 28% c. 30% d. 33%

2. The collection efficiency of a Flat plate collector can be improved by
   a. Putting a non-selective coating on the plate
   b. Evacuating the space above the absorber plate
   c. Removing the glazing of the collector
   d. Placing horizontally in our geography

3. Which of the following is the major feedstock for household biogas plants in Nepal?
   a. Kitchen waste b. Leaves c. Cattle dung d. Industrial waste

4. A factory is in a region where the insolation is 5.5 kWh m^{-2} d^{-1}. What approximate area of solar panels with 17% efficiency would be required to produce 100,000 kWh of electricity per annum?
   a. 200 m^2 b. 300 m^2 c. 400 m^2 d. 450m^2

5. Solar Photovoltaic cells were originally developed for
   a. desert cooling b. winter use c. space program d. brick houses

6. The decomposition of organic matter in the presence of air by microorganisms is termed as _____digestion.
   a. Anaerobic b. Aerobic c. Thermal d. Methanogenic

7. What is Net-Zero Energy?
   a. Net Zero Energy means not using any energy.
   b. Net Zero Energy means not using energy for the internet.
   c. Net Zero Energy means the total amount of energy used is equal to the amount of renewable energy created on site.
   d. Net Zero Energy means using a net to try and capture the energy.

8. When biodegdrable organic materials are decomposed in the absence of air, there produced a gas called
   a. Oxygen b. Carbon dioxide c. biogas d. methane

9. What is one disadvantage of hydropower?
   a. Hydropower is a renewable energy resources.
   b. The power is used as electricity to power large buildings instead of small homes.
   c. Building dams can damage natural aquatic, wildlife and water systems like lakes and rivers.
   d. Most of the time there isn't enough water power to generate electricity.

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

Fill in the blanks.

11. The energy density of renewable sources as compared to the conventional sources is _____

12. The fraction of power in the wind that a modern wind turbine can extract is approximately _____

13. Time required to heat the fuel to the pyrolysis temperature is much shorter than the characteristic pyrolysis reaction time is called _____ pyrolysis.

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

15. In the _____ zone the charcoal reacts with the rising CO_2 and H_2O to make CO and H_2.

16. Fixed dome biodigester provides _____ gas pressure to the biogas stoves.

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

18. Standard Test Condition (STC) of solar PV panels to determine the module efficiency is at Irradiance _____ module temperature _____and air mass _____

19. A toilet connection in domestic biogas plant has _____ influence on the daily gas production, but _____ the additional water requirement.

20. Downdraft gasifier produces typically less than 1% of tar-oils and so are used widely for _____operation.