Mark scored:

KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2018

Level : B.E.
Year : IV
Course : MEPP 428
Semester: II

Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date JUN 2 8 2018

SECTION "A"
[10 Q × 1 = 10 marks]

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

1. Solar Photovoltaic cells were originally developed for
   a) Desert cooling b) Winter use c) The space program d) Brick houses

2. The decomposition of organic matter in the presence of air by microorganisms is termed as……..digestion.
   a) Anaerobic b) Aerobic c) Thermal d) Methanogenic

3. What is Zero Net Energy?
   a) Zero Net Energy means not using any energy.
   b) Zero Net Energy means not using energy from 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.

4. Thousands of mirrors or curved metals are used to focus solar energy to make it very hot, in
   a) Solar cells b) Solar collector c) Solar furnace d) Solar battery

5. When biodegdrable organic materials are decomposed in the absence of air, there produced a gas called
   a) Oxygen b) Carbon dioxide c) Bio gas d) Methane

6. How is geothermal energy harvested?
   a) Solar panels collect the geothermal energy.
   b) The heat from the earth boils water to create steam.
   c) We pump it from the earth and refine it into gasoline.
   d) We drill for it and burn it like a coal or wood.

7. What is one disadvantage of using hydropower?
   a) Hydropower is a renewable energy resources. There are no disadvantages.
   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 create electricity.

8. The amount of oil that may become available for use is called oil ……
   a) Reserves b) Reservoirs c) Resources d) Traps

9. Petroleum products and coal supply approximately ..... of the energy used in Nepal.
   a) 78% b) 17% c) 7% d) 3%

10. Depth of discharge (DOD) is defined as
   a) Percentage of battery capacity that has been charged
   b) Percentage of battery capacity available for charged
   c) Percentage of battery capacity that has been discharged
   d) Percentage of battery capacity available for discharged

SECTION "B"

[10 Q. × 1 = 10 marks]

11. The collection efficiency of a Flat plate collector can be improved by evacuating the space .....the absorber plate.

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

13. The mean wind speed at site A for a wind farm is 15% higher than at site B. The expected increase in electricity production at site A compared to site B is .....?

14. A region where the insolation is 3000 kWh m^{-2} y^{-1}. What area of solar panels with 15% efficiency would be required to produce 50,000 kWh of electricity per annum?

15. The typical capacity factor of solar PV and nuclear energy are.....and....., respectively.

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

17. 50 kg of cattle dung is available for anaerobic digestion plant in Dhulikhel which is operated with 70 days of hydraulic retention time (HRT). The size of the overall anaerobic digester is ----------including 25% of digester volume for biogas storage.

18. The efficiency of solar collector ----------with ----------temperature of absorber.

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

20. 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 .....

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SECTION "C"
[5Q × 11 = 55 marks]

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

1. 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 different types of bio digester used in domestic biogas system and the importance of biochemical process of anaerobic digestion, moreover, you need to provide him calculation of the required plant size, daily water requirement and daily biogas and fertilizer production. [3+3+5]

2. What major policy intervention is required for the paradigm shift of renewable energy development of Nepal from donor driven to market driven mode. With the help of schematic of flat plate solar collector, describe the working principle of the collector. 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]

3. What is Improved Cook Stove (ICS)? Briefly describe the basic design principles of ICS and the efficiency measurement methods of it using cold start water boiling test. Explain in short about Flow Duration Curve (FDC) and Downdraft gasifier. [2+4+5]

4. With the help of suitable diagram, explain how wind energy can be converted into electrical energy. Briefly explain the function of major components of it. Normally wind measurements are taken at 10 m height from ground but wind turbine tower height could be 100 m, how do you estimate the wind speed and power from the wind turbine at 100 m height from the measured wind speed data from 10 m height. [4+4+3]

5. What are the 3 generations of solar PV? Describe ideal IV characteristics of solar cell and the effect of temperature 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 in Morang with the following electric energy requirements. [2+3+6]

Requirements	Place	Power Rating , W	Time used, Hrs
Light	Kitchen	60	4
	Living Room	60	6
	Bed Room	80	4
Television	Living Room	100	4