Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B.Sc./ B. Tech.
Year : IV
Course : ENVS 431
Semester : I
Exam Roll No. :
Registration No. :
Time: 30 mins.
F. M. : 20
Date JUL 14 2017

SECTION "A"
[20Q × 0.5 =10 marks]

Tick (√) the most appropriate answers and fill in the blanks.

1. Bulky metallic waste is composed of metallic objects that occupy large volumes, usually greater than
(a) 0.5 m^3 (b) 3 m^3 (c) 2 m^3 (d) 5 m^3

2. Biodegradable fraction is expressed as BF =
(a) 0.83 – 0.028 LC (b) 0.083 – 0.028 LC (c) 0.028 – 0.83 LC (d) 0.83 – 0.28 LC

3. The highest heating valve is of:
(a) Rubbish (b) Garbage (c) Hospital waste (d) Industrial waste

4. The highest moisture content is in:
(a) Garbage (b) Rubbish (c) Agricultural waste (d) Hospital waste

5. Leachate in young aged LFS has ..... as compared to matured aged LFS.
(a) high BOD and COD (b) low BOD and COD
(c) high BOD and low COD (d) low BOD and high COD

6. Which of the followings is the most appropriate for identification of new LFS?
(a) Mathematical modelling (b) Statistical modelling
(c) Geographical modelling (d) Hydrological modelling

7. The main purpose of the liners in LFS is to
(a) Minimize Leachate production (b) Composting
(c) Control runoff water (d) Minimize gas production

8. Write down one example of the followings.
(a) Domestic waste..... (b) E-waste .....

9. Transfer station is considered when haulage distance is
(a) Greater than 10 km (b) Less than 10 km
(c) Greater than 7 km (d) Less than 7 km

10. Which of the following vehicle has highest waste carrying capacity?
(a) Skip (b) Tractor trailer (c) Tipper (d) Miller truck

11. For load count analysis in SW generation study, normally.....days continuous survey is needed.

12. The densities of solid waste vary markedly with geographic location, season of the year and .....

13. Write down the formula for compaction ratio (**r**) = ...

14. Biological Volatile Solids (BVS) is the fraction of ..... during treatment.

15. Pickup time per trip (hr/trip) for HCS is calculated as Phcs = Pc + Uc + dbc
Where dbc is taken as ..... hr/trip.

16. Bench is provided where the height of the landfill exceeds to ..... meters.

17. The trench (or ditch) method is used in flat regions and consists of periodically digging trenches ..... meters depth with an excavator or tracked dozers.

18. Full form for **MRF** is .....

19. Cover after completing the lift; often thicker than daily cover is called ..... cover.

20. While designing and constructing LFS..... are provided for drainage purpose.

SECTION "B"

[10Q × 1 = 10 marks]

Define the following terminologies in one sentence.

21. Bench in LFS:

22. Assimilation capacity:

23. Hazardous wastes:

24. 3 R principle:

25. Water balance in LFS (write down formula only):

26. Biodegradability:

27. Vermi - composting:

28. Leachate:

29. Methanogenic reaction in waste decomposition process:

30. Basel convention:

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SECTION "C"

Attempt ALL questions.

1. Calculate the length and breadth of the square shaped landfill of Tansen Municipality of Palpa district if the per capita waste generation is 280 gm and average projected population is 12,00,000 for one decade. Calculate the area required if 10% of the waste produced per capita is added for commercial and other wastes and 75% of the waste is expected to reach the landfill site. It is estimated that there will be 5 cells in 1 lift of 5 m including daily cover height of 15 cm and intermittent cover of 30 cm. The landfill allows maximum of 5 lifts. [8]

2. What will be the break even haul distance between a direct haul system and a transfer station operation with the following properties? [8]
   - Direct haul system uses 4 m^3 skips
   - Cost of operation of skip vehicles = Rs. 9/m^3-km
   - The transfer station (TS) uses 20 m^3 transfer trailer
   - The cost of operation of tractor trailer = Rs. 3.50/m^3-km
   - Initial investment in TS = Rs. 35000000 (for buildings, equipment, facilities, etc.)
   - Useful life of TS = 20 years
   - Interest rate = 10%
   - Cost of operation and maintenance of TS = Rs. 500000/yr
   - Volume of waste handled = 400000 m^3/yr

3. Explain the history of development of solid waste management in Nepal highlighting the positive and negative aspects of the German project in Kathmandu valley. Give your opinion for effective SWM in Kathmandu valley? [8]

4. What are the principal factors considered while planning landfill sites? Explain the types and methods of land filling with figures? [8]

5. Explain the methods of on-site management of low, medium and high rise buildings. [4]

6. Define field capacity and permeability. Calculate the heat value of Ethanol using Modified Dulong's formula. [4]

7. What are the methods of estimation of waste quantities? Explain the load-count analysis method. [5]

   OR

   Define ISSWM. Draw and explain material flow and waste generation diagram.

8. Explain the purposes and uses of linear in LFS with figure. [4]

9. Write short notes on (*ANY TWO*) [2 × 3 = 6]
   i. Incineration
   ii. Types of composting
   iii. Design consideration of transfer station