KATHMANDU UNIVERSITY
End Semester Examination
August, 2019

Marks scored:

Level : B.E./B.Sc./B.Tech.
Year : I

Course : ENVE 101
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date AUG 1 2 2019

SECTION "A"
[20 Q × 1 = 20 marks]

Mark [X] in the most appropriate options.

1. During technical analysis we may not have all the information needed to make decisions. We try to fulfill this gap by making reasonable .....
[ ] arguments [ ] policies [ ] theories [ ] assumptions

2. A stream has a sediment concentration of 1000 mg/L. If the flow of the stream is 1500 MLD, the mass flow rate of the sediment in the stream is ..... kg/s.
[ ] 17 [ ] 170 [ ] 1700 [ ] 1.5

3. What is the design parameter for sedimentation tank, which can be altered by varying the volumetric flow rate and the horizontal surface area of the tank?
[ ] height [ ] overflow rate [ ] settling speed [ ] slope

4. Which is the correct unit for kilometers?
[ ] Km [ ] Kms [ ] kms [ ] km

5. Five ppb of benzene in water means that 1 g of water contains ..... g of benzene.
[ ] 5 [ ] 5×10^{-9} [ ] 5×10^{-3} [ ] 5×10^{-6}

6. Mass of microorganisms produced per unit mass of substrate used is
[ ] decay constant [ ] growth rate constant
[ ] yield coefficient [ ] bioaccumulation

7. Maximizing the visual aesthetics is ..... design.
[ ] safe [ ] context-sensitive [ ] smart [ ] eco

8. Under steady-state removal of a pollutant with a first-order reaction, reaction volume = 580 m^3, flow rate = 14 m^3/d, and reaction rate coefficient = 0.05 d^{-1} and initial concentration = 20 mg/L. What is the final concentration?
[ ] 10 [ ] 61.4 [ ] 6.5 [ ] 0.016

9. Release of methane from dumped solid waste in a landfill site is an example of ..... mass transfer.
[ ] solid-gas [ ] solid-solid [ ] gas-liquid [ ] solid-liquid

10. A fine particle settles at a terminal velocity of 0.1m/s in a water tank of depth 1m. What is the settling time of the particle?
[ ] 1 s [ ] 0.1 s [ ] 10 s [ ] 100 s

11. The part of the precipitation that flows over the surface of the earth or just immediately beneath the surface of the earth is called .....
[ ] spillway [ ] infiltration [ ] transpiration [ ] runoff

12. Engineering is the profession that applies mathematics and ..... to utilize the properties of matter and sources of energy to create useful structures, machines, systems and process.
[ ] physics [ ] science [ ] biology [ ] computers

13. ..... settling refers to the settling, in which each of the particles do not hinder the settling of neighboring particles.
[ ] Discrete [ ] Flocculent [ ] Zone [ ] Compression

14. Which of the following is NOT the goal of life cycle assessment?
[ ] identify alternative product
[ ] minimize Pollution
[ ] reduce the cost of the production
[ ] maximize recycling of materials and waste

15. During impact assessment, global warming may be characterized by
[ ] g ethene eq. [ ] g CO_2-eq. [ ] g NO_3-eq. [ ] g SO_2-eq.

16. If 30 kg of Zn is available for a person, what is the mPR/kg of Zn?
[ ] 0.03 [ ] 33 [ ] 330 [ ] 0.33

17. Which has the highest degree of freedom?
[ ] incrementalism
[ ] optimizing the solution
[ ] re-defining the problem
[ ] re-engineering the system

18. Green engineering is more oriented towards the ....., and to identify ways in which manufactured products are produced and used.
[ ] chemical product
[ ] ecosystem
[ ] process
[ ] toxicology

19. To promote disassembly and value retention, multi-component products should strive for material .....
[ ] balance [ ] diversification [ ] unification [ ] consumption

20. Immortality of a product is associated with
[ ] recycling
[ ] bioaccumulation
[ ] safe disposal
[ ] product efficiency

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Level : B.E./B.Sc./B.Tech.
Year : I
Time : 2 hrs. 30 mins.

Course : ENVE 101
Semester : II
F. M. : 55

SECTION "B"

Attempt *ALL* questions. Assume necessary data with logical explanation.

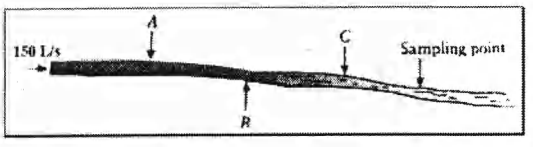
1. Explain why do an engineer need the knowledge of ecosystem? Define the parameters used in Monod kinetics with diagram. Explain how the microbial growth helps in the wastewater treatment process? [2+3+2]

2. How is the knowledge of mass and energy transfer in pollution control and remediation essential in Environmental Engineering domain? Draw the mass balance diagram for the following wastewater treatment system and calculate the final BOD concentration of treated waste water. [2+1+4]
   a. The discharge of wastewater to the treatment system is 430 m^3/day.
   b. The BOD value of incoming waste water is 180 mg/L.
   c. The area and depth of treatment system is 10000 m^2 and 1 m respectively.
   d. The decay coefficient of treatment system is 0.7 per day.

3. List out the four types of particles settling process in a tank. Define discrete and flocculating particles. If the flow in a system is 1000 m^3/day, calculate the volume and length of the tank if depth and HRT are 3 m and ½ day respectively. Assume L:W = 5. [1+2+3+1]

4. a. A stream, (shown in the following figure) flowing at 150 L/s and 20 mg/L of suspended solids, receives wastewater from three separate sources:

Source	Quantity (L/s)	Solids concentration (mg/L)
A	100	200
B	300	50
C	50	200



What are the flow rate and suspended solids concentration downstream at the sampling point? [2+3]

   b. A bar with volume 500 m^3 has 50 smokers in it, each smoking 3 cigarettes per hour. An individual cigarette emits, among other things, about 1.0 mg of formaldehyde (HCHO). Formaldehyde converts to carbon dioxide with a reaction rate coefficient k =10 day^{-1}. Fresh air enters the bar at the rate of 1,000 m^3/h, and stale air leaves at the same rate. Assuming complete mixing, estimate the steady-state concentration of formaldehyde in the air. [5]

5. State and explain any two principles of green engineering.
In order to improve the environment of Kathmandu and other major cities, what solutions will you give in terms of incrementalism, reengineering the system and redefinition of the system boundary? [4+3]

6.

a. Why do you understand by a product Life Cycle? Why it is required to perform a Product Life Cycle Assessment (LCA)? What are the main steps in LCA? [1+1+2]

b. For performing LCA of *Polyethylene bag,* provide the following information: [4]
   i. Functional unit
   ii. Obligatory properties
   iii. Positioning properties
   iv. Other products which could provide the same or similar service to the user

7. Write short notes on (*ANY THREE*): [3 × 3 = 9]
a. Hydrological cycle in engineering
b. Characteristics of professionalism
c. Nitrogen cycle
d. MECO matrix
e. Engineering decisions