

KATHMANDU UNIVERSITY
End Semester Examination
September 2024

Marks Scored:

Level : B.E./B.Sc.

Year : I

Exam Roll No. :

Registration No.:

02 OCT 2024

Time: 30 mins.

Course : ENVE 101

Semester : II

F. M. : 20

Date : 02 OCT 2024

SECTION "A"

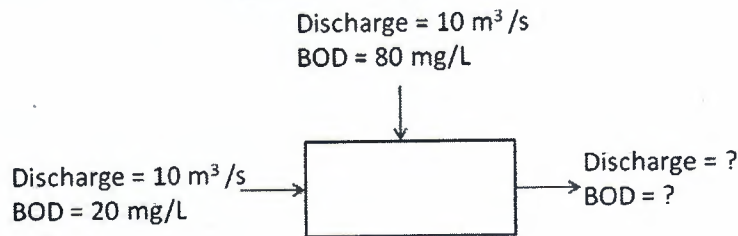
[20 Q. × 1 = 20 marks]

Choose and encircle the most appropriate answer.

- Which of the following is a primary focus of Environmental Engineering?
 - Designing and operating water and wastewater treatment plants
 - Designing the new machine
 - Enhancing the efficiency of transportation systems
 - Creating advanced computing systems
- Which prefix represents 10^{-6} in the system of units?
 - Nano
 - Micro
 - Milli
 - Pico
- The Hydraulic Retention Time (HRT) of a tank represents _____.
 - The time it takes to fill the tank
 - The time an average particle of the fluid spends in the tank
 - The volume of the tank
 - The flow rate of the water through the tank
- A sedimentation tank with a dimension of $100\text{m} \times 10\text{m} \times 4\text{m}$ is treating a waste stream of $8000\text{m}^3/\text{day}$, the hydraulic retention time of the tank is:
 - 12 hrs
 - 48 hrs
 - 12 days
 - 0.5 hrs
- Catchment area is _____.
 - the area of land draining into a stream or a water course.
 - small rivers that join the main river.
 - the place where a river flows into another body of water.
 - water lost from seepage.
- What is the primary process through which water changes from liquid to gas in the hydrologic cycle?
 - Precipitation
 - Evaporation
 - Condensation
 - Runoff
- The mass balance equation for non-steady state non-conservative system is _____.
 - Input = Output
 - Accumulation = Input + Output
 - Input = Output + KCV
 - Accumulation = Input + Output + G - KCV
- Which type of property does not depend on the amount of matter present?
 - Extensive properties
 - Intensive properties
 - Physical properties
 - Chemical properties
- What method is used to remove suspended particles from water?
 - Filtration
 - Aeration
 - Coagulation
 - Sedimentation
- Which of the following unit are provided in intake of water Supply System?
 - Filtration
 - Disinfection
 - Screening
 - Aeration

11. _____ work is the process of carrying water from intake to the treatment unit is called
a. Collection b. Distribution c. Transmission d. Treatment

12. The BOD in the lake output in the figure shown below is:



- a. 120 mg/L b. 50 mg/L c. 60 mg/L d. 80 mg/L
13. In wastewater treatment, what does "primary treatment" typically involve?
a. Chemical reactions to remove dissolved pollutants.
b. Tertiary treatment to remove remaining pollutants.
c. Biological processes to degrade organic matter.
d. Physical methods to remove large solids and floating materials.
14. The Monod equation is used to describe the relationship between which of the following in biological wastewater treatment?
a. Growth rate of microorganisms and the concentration of the limiting substrate.
b. Temperature and rate of chemical reaction.
c. Flow rate of wastewater and the size of treatment tanks.
d. Removal efficiency of suspended solids and the type of filter used.
15. The phase when microbes start declining from its peak is known _____ Phase.
a. Lag b. Log c. Endogenous d. Stationary
16. Air quality standards are _____.
a. Measure of how clean or polluted the air is.
b. Presence of contaminants in the atmosphere.
c. Devices that work to prevent a variety of different pollutants.
d. Acceptable threshold level of air pollution
17. The sound power level results from combining the 65 dB, 60 dB, and 70 dB is _____.
a. 72 b. 75 c. 70 d. 65
18. What does the process of 'transfer and transport' in solid waste management involve?
a. Gathering of solid wastes and their storage
b. Moving wastes from collection vehicles to larger transport equipment and transporting them to disposal sites
c. Processing waste to recover usable materials
d. Final disposal of waste in landfills or incinerators
19. Environmental Impact Assessment (EIA) is conducted for _____.
a. Products b. Policies c. Projects d. None
20. Which of the following is an example of a project requiring an Initial Environmental Examination (IEE) in Nepal?
a. A new road construction of up to 25 km.
b. A hospital with 10 beds.
c. Hydropower above 50 MW.
d. A water supply project with a capacity of 5 MLD

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F. M. : 55

Make a logical assumption wherever required.

SECTION "B"

[6Q. × 8 = 48 marks]

1.
 - a. Explain the concept of Internal Rate of Return (IRR) and its significance in evaluating engineering projects. [4]
 - b. A river during the dry season has a sediment load of up to 1500 mg/L. 75% water from this river is channeled through a pump station and delivered to a water treatment facility. The flow rate at the pump station is 30 liters per second (lps).
 - i. Draw the schematic diagram of the system. [1]
 - ii. Calculate the mass flow rate of sediment entering the treatment facility. [2]
 - iii. If the treatment facility is capable of removing 85% of the suspended solids, determine the concentration of sediments in the treated water (effluent). [1]
2.
 - a. Explain the concept of eutrophication of lake. [3]
 - b. A watershed system covers a surface area of 150 hectares and receives an average monthly precipitation of 1.5 inches. Calculate the average monthly evaporation (m/mo) from the system, given that the inflow to the system is 0.45 m³/s and the outflow from the system is 0.38 m³/s. The net change in water storage within the system is 25,000 m³ over the month. Assume there is no seepage from the system. [5]
3.
 - a. State law of conservation of mass. Define conservative and non-conservative system. [3]
 - b. A bar with volume 500 m³ has 50 smokers in it, each smoking 2 cigarettes per hour. An individual cigarettes emits, among other things about 1.4 mg of formaldehyde. Formaldehyde converts to carbon dioxide with reaction rate coefficient $k = 0.40/\text{hr}$. Fresh air enters the bar at the rate of 1000 m³/hr and stale air leaves at the same rate. Assume the complete mixing (CSTR) and steady state conditions. Calculate the Output concentration (C_{out}) of the mixture. [5]
4.
 - a. With the support of the schematic diagram the sewer system and explain its components. [4]
 - b. Determine the population of a city by 2044 by arithmetical increase methods based on the following information. If per capita demand will be 200 lpd by 2044, Estimate the water demand of the city using arithmetic and geometric projection method. [4]

Year	1964	1974	1984	1994	2004	2014	2024	2044
Population	12000	16500	26800	41500	57500	68000	74100	?

P.T.O.

- 5.
- a. Describe the solid waste management practices in Nepal with examples. [2]
 - b. What are the different sources of solid waste explain briefly. [3]
 - c. Illustrate the properties of solid waste in short. [3]
- 6.
- a. Explain the purpose and goals of Life Cycle Assessment (LCA) and list the four stages involved in conducting an LCA. How does the concept of "cradle to grave" relate to the assessment? [1+2+2]

OR

Discuss how the principles of Green Engineering can be applied to minimize environmental impacts during the life cycle of a product. Provide examples to illustrate how at least two of these principles can be implemented in the design process. [3+2]

- b. Determine the collection efficiency of an electrostatic precipitator (ESP) tube that is 0.3 m in diameter and 2.00 m in length for particles that are 1.00 μm in diameter. The flow rate is 0.150 m³/s, the drift velocity is 1.39×10^{-3} m/s. [3]

SECTION "C"

[7 marks]

7. Provide brief answer of the following.
- a. Write two major objectives of Nepal Engineering Council. [2]
 - b. What is Functional Unit of the product? [1]
8. Write Short Notes on **ANY TWO** of the following. [2+2=4]
- a. Environmental Assessment
 - b. Monod Equation
 - c. Drinking water treatment