

KATHMANDU UNIVERSITY  
End Semester Examination  
May/June, 2022

Marks Scored:

Level : B.E.

Year : III

Course : CIEG 313

Semester: II

Exam. Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date :

SECTION "A"

[20Q. × 0.5 = 10 marks]

Encircle the most appropriate answer among the given choices.

1. In a water conveyance system, which of the following valves will work automatically?  
a. Butterfly valve    b. Check valve    c. Gate valve    d. Scour valve
2. If 40 ml of an odourous water sample needed 160 ml of odour free distilled water to produce 200 ml of odour free mixture, then the threshold odour number (TON) is  
a. 0.6    b. 0.8    c. 5.0    d. 15.8
3. Identify the correct relationship between the following?  
a.  $TDS = TS - TSS$     b.  $TDS = TS + TSS$   
c.  $TS = TSS - TDS$     d.  $TS = \frac{TSS}{TDS}$
4. Street inlet provided with settling basin to trap grit, sand etc. to avoid their entry into sewer is called  
a. clean out    b. catch basin    c. flushing tank    d. siphon spillway
5. In activated sludge process, sewage effluent mixed with the activated sludge enters into  
a. aeration tank    b. digestion tank    c. skimming tank    d. sedimentation tank
6. 100 ml of raw sewage was diluted by specially prepared water, in a 300 ml capacity BOD bottle. The DO concentration of the diluted sample at the beginning of the test was 19.10 mg/l and 1.20 mg/l after 5 day incubation at 20° C. The BOD of raw sewage is  
a. 5.97 mg/l    b. 11.17 mg/l    c. 17.90 mg/l    d. 53.70 mg/l
7. The method of distribution of water is divided into how many types?  
a. 5    b. 4    c. 3    d. 2
8. The water which is neither chemically pure nor contain anything harmful matters to human health but contains useful minerals to the human health is termed as  
a. pure water    b. potable water    c. palatable water    d. wholesome water
9. The conveyance system in which strength of sewage is normally diluted than its initial strength is  
a. combine system    b. separate system  
c. partially separate system    d. partially combined system

10. Primary treatment of wastewater uses  
a. sedimentation tank                      b. skimming tank  
c. aeration tank                              d. digestion tank
11. Which one of the following source will generally contain water with the maximum amount of turbidity?  
a. Rivers                      b. Wells                      c. Lakes                      d. Oceans
12. Organic solids separated out from the sedimentation tank are stabilized in  
a. trickling filter                              b. skimming tank  
c. secondary clarifier                        d. digestion tank
13. What is the design discharge for intake structures?  
a. Average daily demand of water              b. Maximum weekly demand of water  
c. Maximum daily demand of water            d. Maximum hourly demand of water
14. A treatment unit developed on algal-bacteria mutual symbiosis is  
a. activated sludge process                      b. aerated lagoon  
c. waste stabilization pond                      d. oxidation ditch
15. A combination of arithmetic and geometrical increase method for forecasting of population is used in  
a. logistic curve method                        b. incremental increase method  
c. decreasing rate of growth method            d. ratio method
16. The ultimate BOD value of the waste  
a. decrease with fall in temperature              b. increase with rise in temperature  
c. increase with fall in temperature              d. remains same at all temperature
17. Alum when added as a coagulant in water  
a. does not affect pH value of water              b. increase pH value of water  
c. decrease pH value of water                      d. does not require alkalinity for flocculation
18. The techniques of overland runoff for disposal of sewage by land treatment is applied when  
a. sewage is used for irrigation                      b. soil have poor permeability  
c. soil have good permeability                      d. sewage is from industries
19. The velocity of flow of water in a sedimentation tank is about  
a. 15-30 cm/hr.                      b. 15-30 cm/min.                      c. 15-30 cm/s.                      d. 5-10 cm/s.
20. For a given discharge, the efficiency of sedimentation tank can be increased by  
a. increasing the depth of tank  
b. decreasing the depth of tank  
c. decreasing the length and breadth of tank  
d. increasing the length and breadth of tank

KATHMANDU UNIVERISTY  
End Semester Examination  
May/June, 2022

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

Course : CIEG 313  
Semester: II  
F.M. : 40

SECTION "B"  
[4Q. × 5 = 20 marks]

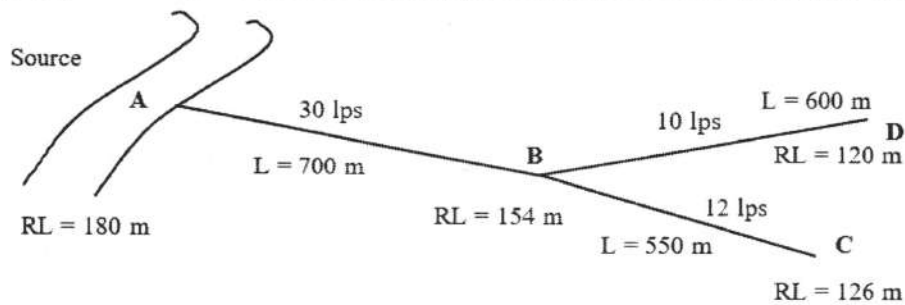
Attempt *ANY FOUR* questions. Assume suitable data if necessary.

1. a. Briefly explain the key objectives of any water supply system. [2]  
b. Explain apportionment or ratio method of forecasting population with help of appropriate figure. [3]
2. a. A sedimentation tank is designed for an overflow rate of 5000 liters per m<sup>2</sup> per hour. What percentage of particles of diameter 0.06 mm will be removed in this tank? Temperature of water is 20°C and the specific gravity of particle is 2.65. [2]  
b. Which type of river intake will you propose for rivers in the context of Nepal? Explain the features of the proposed intake in detail with the help of a well labeled figure. [3]
3. a. Under which conditions will you incorporate a rapid sand filter in the water treatment process? Explain it in brief. [2]  
b. The analysis of a sample of water shows the following results in mg/l: [3]  
Na = 20; K = 30; Ca = 7; Mg = 12; Cl = 40; HCO<sub>3</sub> = 68; SO<sub>4</sub> = 7; NO<sub>3</sub> = 12  
The concentration of Sr is 2.52 mg/l as CaCO<sub>3</sub> and the carbonate alkalinity in this water is zero. Calculate the total hardness, carbonate hardness and non-carbonate hardness.
4. a. Explain what the taste of water indicates. [1]  
b. For the water supply of a small town with the daily requirement of 1.25 MLD, it is proposed to construct a distribution reservoir. The pattern of demand is as under: [4]

Time	Demand
7 am to 8 am	20 % of Day's Supply
8 am to 5 pm	35 % of Day's Supply
5 pm to 8 pm	30 % of Day's Supply
8 pm to 7 am	15 % of Day's Supply

The supply to the distribution reservoir is to be done by pumping at a constant rate of 0.21 l/hr from 7 am to 9 am and 2 pm to 6 pm. Determine the capacity of the distribution reservoir. Do consider the fire demand as well.

5. Design pipeline AB, BC and BD in the pipe network as shown in figure below. [5]



Minimum pressure in the pipeline should be 15 m. Take Peak factor of 2 and Hazen William's coefficient as 100.

SECTION "C"

[4Q. × 5 = 20 marks]

Attempt *ANY FOUR* questions. Assume suitable data if necessary.

6.
  - a. Under which conditions will you introduce manholes in the sewer network? Explain it briefly with appropriate figures. [3]
  - b. Briefly explain the working mechanism of grease and oil trap with the help of a well labeled figure. [2]
7.
  - a. Briefly explain the key differences between BOD and COD of wastewater. [2]
  - b. For a wastewater sample,  $BOD_5$  for  $20^\circ C$  is 190 mg/l and is 86 % of the ultimate BOD. What will be a 4 day BOD at  $25^\circ C$ ? [3]
8.
  - a. Explain the oxygen sag curve of a stream during the self-purification process in detail. [3]
  - b. How wastewater can be disposed of in the land? Explain the most appropriate method in your view with the help of figure. [2]
9.
  - a. Why is secondary treatment necessary in wastewater treatment? Explain it in brief. [2]
  - b. Explain the working principle of trickling filter with the help of appropriate figures. [3]
10.
  - a. Why is treatment of sludge necessary? Explain it in brief. [2]
  - b. Describe the purpose of sludge dewatering. Explain any one method of sludge dewatering process with the help of appropriate figure. [3]