TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2083 Baishakh

Exam.	Back (New Course)		
Level	BE	Full Marks	60
Programme	BCE	Pass Marks	24
Year / Part	II / II	Time	3 hrs.

Subject: - Water Supply Engineering (*ENCE 254*)

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

Group 'A' [7×2]

1. Define palatable and potable water with example.
2. What is the importance of understating yield in drinking water system?
3. Explain the significance of peak factor in water supply system.
4. Justify the environmental significance of emerging pollutants.
5. Define the membrane filtration and electrodialysis process in water treatment.
6. State the primary functions of District Metered Areas (DMAs) in a smart water distribution system.
7. Recommend the practicability of spigot and electrofusion pipe joints.

Group 'B' [7×4]

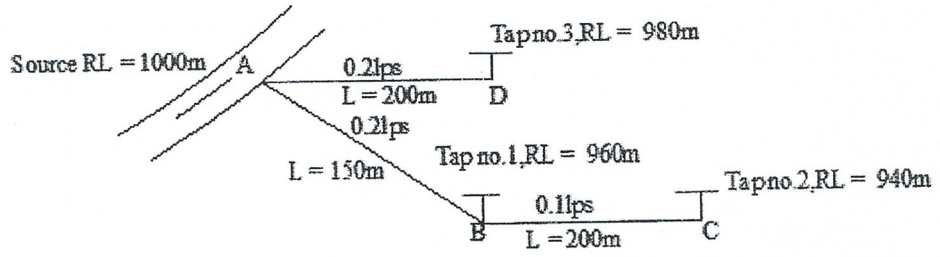
8. List the threats posed by climate change to spring water availability and recommend the corresponding conservation strategies in the hilly regions of Nepal.
9. Calculate the design discharge for design year 2040 for a village in Rolpa District. The data collected in survey year 2025 are given as: Survey year population = 1700, Population growth rate = 1.8 % per year, Number of buffaloes = 300.
10. Explain the standard plate count method used to detect and quantify E. coli in public health laboratories.
11. With a neat labeled sketch, describe the working mechanism of a spring intake.
12. Evaluate the performance behavior of plain sedimentation tank and sedimentation with coagulation.
13. A water treatment plant is disinfecting water using chlorine. According to Chick's Law, the inactivation of bacteria follows first-order kinetics. If the initial number of bacteria is 1.0×106 CFU/mL and is reduced to 1.0×103 CFU/mL after 5 minutes of contact with chlorine, calculate the disinfection rate constant k and explain its environmental significance.
14. Define fittings with examples. Justify the need of dismantling joints and flushing arrangements for pipeline.

Group 'C' [3×6]

15. An old tank having dimension of 11m x 5m x 3m is available in a village. It is proposed to use as a settling tank. At least 93% of particles having diameter of 0.025 mm, specific gravity 2.65 is expected to remove on the tank at 20°C. What will be an overflow rate on using that tank? Does the tank dimension is enough to remove 99% of particles having diameter 0.05 mm at same condition?

16. A town with a population of 38,000 in the year 2025 AD has a water supply rate of 150 lpcd. Determine the number and of the rapid sand filter for the design year 2045. Assume that annual population growth rate of the town as 4.5%.

17. A scheme layout of a rural water supply system is provided in figure below. Design pipelines AB, BC, and AD. A minimum pressure of 5 meters of water is required at taps. Assume Hazen Williams coefficient as 150.



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2082 Bhadra

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCE	Pass Marks	24
Year / Part	II / II	Time	3 hrs.

Subject: - Water Supply Engineering (*ENCE 254*)

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- ✓ *Attempt **All** questions.*
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- ✓ *Assume suitable data if necessary.*

[7×2]

Group 'A'

1. Justify the roles of water from the WASH perspectives.
2. Define the technical and legal considerations in selecting water sources with examples.
3. What are the base period, design period in water quantity estimation, and their purposes?
4. Highlight the significance of temperature on health, environment and engineering aspects.
5. Define advanced oxidation process and disinfection kinetics.
6. What is meant by smart water distribution system? And list its main features.
7. Recommend the practicability of flushing arrangements in water supply system.

[7×4]

Group 'B'

1. Define water cycle. Explain the role of climate change posing threats to water availability in Terai region.
2. Justify the use of population forecasting methods with their suitability under different circumstances.
3. The chemical analysis of a water sample showed that the total hardness of a water sample is 410 mg/L (as $CaCO_3$), and the carbonate hardness is 105 mg/L as $CaCO_3$. If the concentration of calcium ions is 1.5 times more than that of magnesium ions, determine the total alkalinity of the water sample, and the concentrations of calcium and magnesium ions (in mg/L as $CaCO_3$).
4. If you are assigned as an environmental engineer to design a river intake, what design considerations you would prefer and why?
5. Define coagulation and flocculation. Also, describe their mechanism with suitable example.
6. Compare particle (sand) and membrane filters with their pollutant removal mechanism.
7. Discuss the practical application of Interruption Chambers (ICs) and Break Pressure Tanks (BPTs) in particular locations of water supply system.

[3×6]

Group 'C'

1. A rectangular sedimentation tank is designed to treat 12 MLD of water to trap particles larger than 0.04 mm (specific gravity 2.65) at 20°C. Compute the tank dimensions and detention time.
2. An experiment shows that a concentration of 0.2 g/m^3 of free available chlorine achieves 99 % reduction of E. colli in 10 minutes. What contact time is required to achieve 99.9 % reduction of same bacteria at a free available chlorine concentration of 0.04 g/m^3? Assume Chick's Law and Watson's Law, apply with n = 1.
3. The water demand of a town is 4,000 m^3/day. The water demand is to be met through pumping from a tube well. The tentative pumping period is 3 to 9 hours in the morning and 16 to 20 hours in the evening. The water is supplied to the consumers from the reservoir by intermittent system from 4 to 7 hours in the morning and 16 to 18 hours in the evening. Calculate the capacity of balancing reservoir.

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