BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environmental, Water Resources, and Coastal Engineering, Term Final (Spring) Examination 2025: Oct - Nov 2025

Student Group: 72<Earned Credit Hours ≤ 108

Subject: EWCE 331, Water Supply Engineering

Time: 3.00 hours **Full Marks: 180**

INSTRUCTIONS:

a. Use **SEPARATE** answer scripts for each section.
b. **Question-1** in **Section-A** and **Question-5** in **Section-B** are compulsory.
c. Answer any other **TWO** out of the remaining **THREE** questions from each section.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
f. **Symbols** and **abbreviations** used have their usual meanings.

SECTION-A

Question 1 (Compulsory)

a. As an Environmental Engineer, you are required to study the feasibility of the groundwater and surface water sources as viable options for water supply. Make an evaluation of the problems of both sources if you are required to consider both groundwater development and surface water development. **07**

b. Explain the factors affecting per capita consumption of water. **08**

c. Define fire demand. Describe how you will calculate fire demand. **05**

d. The population of a town was 62,750 in 2019 and 76,310 in 2024. After how many years, population of this town will be 97,220? Calculate the fire demand by using Kuichling's formula for the population of the year 2029. **10**

Question 2

a. Explain why cone of depression is created during pumping of well. Derive the equation of discharge through an unconfined aquifer. **10**

b. Define the interference of well. Explain how it can be overcome. **04**

c. Explain the technique and parameters to be used to select the most productive zone of the aquifer. Explain how you can clean the perforations of a tubewell screen and remove the incrustations near the screen. **06**

d. A fully penetrating well of diameter 0.4m is abstracting water from a 2.5m thick confined aquifer. The steady state drawdown at 8m and 50m distances were observed to be 2.5m and 0.6m, respectively. Compute the steady-state discharge and drawdown of the pumping well. The coefficient of permeability is 10^{-3} m/s. **10**

Question 3

a. Explain the reasoning for providing pumps in a water supply system. Explain the operations of any pump that is widely used in modern waterworks. **10**

b. List down the methods of well drilling and briefly describe any method suitable for Dhaka city. **10**

c. Design the transmission main and the pumping unit from the following data: **10**
   (i) Water supply rate = 50 gpcd
   (ii) Estimated population = 75000
   (iii) Ground RL at the pump house = 102.50 ft
   (iv) Treatment plant RL = 196.00 ft
   (v) Velocity through pipe = 10 fps
   (vi) Pumping time = 10 hrs daily
   (vii) Total length of pipe = 4000 ft
   (viii) Friction factor = 0.01
   (ix) Efficiency = 70%

Question 4

a. Briefly explain the technologies that can be adopted as alternative water supply options if the nearby pond water is required for drinking purpose. **08**

b. Explain the problems of a community based water supply system in Bangladesh. **04**

c. Differentiate between apparent loss and real loss of water. Discuss the procedure of leak detection in a water pipeline. **08**

d. Design the minimum capacity of the storage tank required for a family of 10 persons to be supplied with 12 lpcd of rainwater. The yearly rainfall intensity is 2650 mm and the rainfall distribution is such that at least 35% of the rainwater must be stored for uninterrupted water supply throughout the year. Also calculate the minimum catchment area required, if the runoff coefficient is 0.85. **10**

SECTION-B

Question 5 (Compulsory)

a. Explain the mechanism of sedimentation and slow sand filtration processes used for water treatment. **10**

b. Briefly explain the oxidation and co-precipitation adsorption process used for arsenic removal from water. **10**

c. Analyze the pipe network shown in Figure 5(c) by the Hardy Cross Method for pipe flow, with given pipe length, L and pipe diameters, D. Nodal inflow at A and nodal outflows at nodes B and D are shown in the figure. Assume a constant friction factor, f = 0.02. Show at least two iterations for each loop. **20**

Question 6

a. Describe the aeration-filtration and ion-exchange processes for iron and manganese removal from source water. **10**

b. Identify the limitations of dead end water distribution network system. Explain how the looped distribution system can overcome those limitations. **15**

Question 7

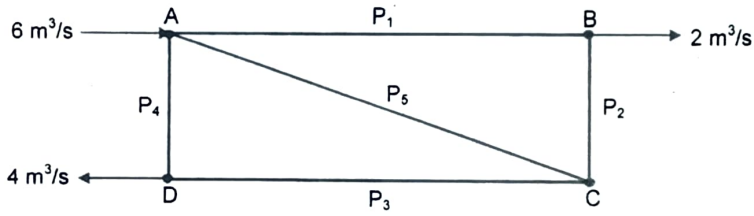
a. For the pipe system, shown in Figure 7(a), determine the length of a single equivalent pipe that has the diameter of 8 inches. Use Hazen William equation. Assume C_{HW} = 120 for all pipes shown in the figure. **15**

b. Describe the water softening processes for removal of carbonate and non-carbonate hardness. **10**

Question 8

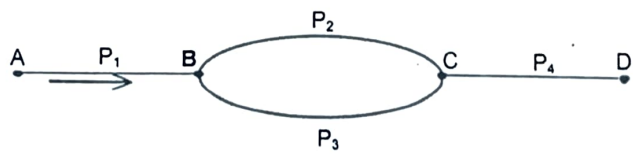
a. Briefly explain the basic treatment schemes for surface water and ground water. **10**

b. Identity the treatment processes to remove taste and odor in water caused by the presence of hydrogen sulfide. Explain why chlorination is required in iron and manganese removal plants. **5+10=15**



	P_1	P_2	P_3	P_4	P_5
Length (m)	1200	800	1200	800	1445
Diameter (m)	0.3	0.2	0.3	0.2	0.3

Figure 5(c)



	P_1	P_2	P_3	P_4	
Length (ft)	1000	1800	1800	100	Flow at P_2 is 450 gpm
Diameter (in)	10	8	8	10	

Figure 7(a)