

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2018
III RD YEAR, 1ST Semester Examination

SUBJECT: WATER SUPPLY ENGINEERING

Full Marks 30/100

Time: ~~Two hours~~/Three hours/~~Four hours~~/Six hours

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks:60)	Marks
	<p>Answer Question No. 1 (Compulsory) and Any 3 from the rest.</p> <p>Assume relevant data if necessary.</p>	
Q1.	<p>Answer the following questions (any six)</p> <p>(a) Why adsorption methods is more useful and efficient than other unit processes for removal of Dissolved impurities?</p> <p>(b) Do you agree that break point chlorination is safe for disinfection process? State the reason.</p> <p>(c) Justify the Stern layer is not merely a layer only.</p> <p>(d) Ideal settling basin is difficult to achieve in reality- justify the statement.</p> <p>(e) Why iron based alum is more effective than common Alum?</p> <p>(f) Why depth is not an important criterion for design of settling tank?</p> <p>(g) Why slow sand filter is more efficient than rapid sand filter unit? Justify your answer.</p>	6x 2=12
Q2.	<p>Discuss the backwashing process in rapid gravity sand filter showing different operating valves at different locations.</p> <p>(i)</p> <p>(ii) Compare different types of gravity filter units employed in water treatment.</p> <p>(iii) In an experiment, it is found that at pH 7.5, 0.45mg/L as chlorine dose is required for effective disinfection. What dosage will be necessary at pH 8.0. If it is given that initially 10 mins contact time is necessary at pH 7.5, find contact time at pH8.0 if dilution co-efficient is 1.5, Assume-Ki= 2.8×10^{-8} Mol /L. Deduce any relevant formula necessary for solving the problem. Use Chicks law also.</p>	4 4 8
Q3.	<p>(a) Derive Stokes law to determine the settling velocity of a particle in water. Under what condition it is valid?</p> <p>(b) Determine the settling velocity of a particle of size 0.10mm dia with sp.gr. 2.65 at 25 C. Assume kinematic viscosity = 0.90 centistokes.</p> <p>(c) The water works of a city treats 50 MLD of water in a clariflocculator. The quantity of alum consumed is 15 mg/ L of water. If the alkalinity of raw water is equivalent to 1 mg/L of CaCO₃ Estimate the quantity of alum and quick lime of 80% purity to be required on monthly basis.</p>	6 6 4

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2018
III RD YEAR, 1ST Semester Examination

SUBJECT: WATER SUPPLY ENGINEERING

Full Marks 30/100

Time: ~~Two hours/Three hours/Four hours/ Six hours~~

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks:60)	Ma
Q4.	<p>What is meant by " Ideal settling basin" ?.</p> <p>(a) State different assumption that to be considered for developing overflow rate in the above tank.</p> <p>(b) Derive an expression to show that overflow rate in the settling tank is equal to settling velocity of the particle.</p> <p>(c) In the light of alum as coagulant discuss the theory of destabilization of colloidal solid in water with the help of chemical equation.</p> <p>(d) Discuss the different functional mechanisms of filtration process in water.</p>	1. 2. 3.
Q5.	<p>(a) The height of a presettling tank is 4.0 m. Determine the length of the tank if the finest particle will not scour again by displacement from following consideration:-</p> <p>i) size of the particle = 0.01 cm. ii) Temperature of water= 20 C iii) Friction factor " f" = 0.025 iv) specific gravity= 1.50 v) Beta(B) = 0.04 Assume kinematic viscosity= 1.01×10^{-2} cm²/sec.</p> <p>(b) Laboratory tests show that 99.9% kill could be obtained in 10 min with a concentration of 14mg/l. What should be the contact time to obtain 99.99% kill with the same dose of the disinfectant?</p> <p>(c) A drinking water source is found with following raw water quality:- i) Hardness- 400 mg/ L II) Odour- fishy Iii) Dissoved Iron= 2.0 mg/L. Suggest a suitable flow diagram with logical justification for rendering the water fit for drinking purpose.</p>	7 4 5

B.CIVIL ENGG. 3rd YEAR 1ST SEM. EXAMINATION 2018

WATER SUPPLY ENGINEERING

Time: Three hours

Full Marks 100
(40 marks for part II)

Use a separate Answer-Script for each part

Part-II

Question no. 1 is compulsory
 Answer any **two** from the rest
Hazen-William's nomogram is allowed
(Assume any data, if required, reasonably)

Answer the following questions

(4+3+3+3+3) = 16

- I. Describe the determination method of most probable number of fecal coliform by multiple tube fermentation test
- II. Advantages and disadvantages of intermediate and continuous systems of water supply
- III. Influence of population on peak factor of municipal water demand
- IV. Name the pollutant responsible for the disease: Keratosis; Emesis; Fluorosis; Minamata disease, plumbism; blue baby disease
- V. Distribution of domestic water demand as per CPHEEO for LIG

What are the factors responsible for change in population growth? Deduce the expression for 'geometric increase method' of population projection.

The populations of a town as per the Census record are given below for the years 1961 to 2011. Assuming that the scheme of water supply will commence to function from 2020, it is required to estimate the population of 30 years and also the intermediate population of 15 years after 2020.

Year	1961	1971	1981	1991	2001	2011
Population	42,320	65,830	85,250	101,860	128,710	162,180

Project the population by 'geometric increase method' and also show the % change of population projection from 'arithmetic increase method'.

3.

- a) What is the amount of agricultural water demand (in %) w.r.t. total water demand? Propose some systems to minimize the water requirement of agricultural demand. 3
- b) What is coincident draft? How fire water requirement, including multistoried building, should be managed as per CPHEEO? 3
- c) Specific gravity of a sulfuric acid is 1.84 and contains 98% by weight of H_2SO_4 . Find out the molarity and normality of the acid. 3
- d) What are the different forms of nitrogen may present in the contaminated river water? Show their distribution with time. 4

4.

- a) In a distribution/service storage reservoir if for the first 10 hours maximum surplus amount is 8 m^3 and for the next 14 hours maximum deficit amount is 6 m^3 then (i) what will be the reservoir capacity? and (ii) at the starting of the reservoir what will be the amount of water to be present in the reservoir? 2
- b) A water supply system consisting of an underground reservoir with lift pump at 'A' (R.L. of G.L. 201m), withdrawal point at 'B' (R.L. of G.L. 210m) and elevated balancing storage tank at 'C' (R.L. of G.L. 213m). The water supply pipeline is running 1m below ground level (G.L.). Details of piping between 'A', 'B' and 'C' are given below. Consider Hazen-William constant C as 100 for all pipes.

Pipe segment	Length (m)	Diameter (mm)
AB	1500	300
BC	900	250

During supply of water at 'B' by lift pump and balancing reservoir, residual head at ferrule to be maintained at withdrawal point 'B' is 22m. Height of the balancing storage tank at 'C' is 30m above G.L. Water is supplied by the lift pump 1m below G.L. at 'A' with a discharge head of 57m of water column.

- i) draw hydraulic grade lines during withdrawal and non-withdrawal of water at 'B'
- ii) during water withdrawal at 'B', find flow through AB and CB and total flow at 'B' in l/sec
- iii) during non-withdrawal of water at 'B', find flow of water to the reservoir at 'C' in l/sec