Ref No. –EX/CE/ T/312/2017 (S)

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2017
III RD YEAR, 1ST Semester **SUPPLEMENTARY** Examination

SUBJECT: WATER SUPPLY ENGINEERING

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

Full Marks ~~30~~/100

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks:50)	Marks
	Answer Any Three(3) questions Two marks are reserved for neatness and to the point answer Assume relevant data if not given.	
Q1.		
(a)	What are the major impurities in water that to be treated to render fit for consumptive use? Describe with necessary flow sheet different types of unit operation for making water fit for potable purposes considering the above criteria. Give reasons also.	3+7
(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? Derive necessary expression for solving the problem.	6
Q2.		
(a)	Discuss briefly the overflow velocity and flow through period in discrete particle settling.	4
(b)	Determine the terminal settling velocity of a spherical particle with diameter0.5mm and sp.gr. 2.65 settling through water at 20 degree Celsius. Check the Reynolds number. Assume ρ_w is 998.2 Kg/ m3. $\mu = 1.002 \times 10^{-3}$ N.S/m2. Derive necessary equation for solving the above problem.	12
Q3.		
(a)	Discuss the stability phenomenon on colloids in water. How they can be better explained in the light of Double layer ionic theory.	6
(b)	Alum , Al2 (SO4)3, 18 H2O is to be used for coagulation purpose in a water treatment plant with a capacity of 5mld per hour. The raw water has a natural alkalinity 0f 16mg/l,as CaCO3, how much Ca (OH)2 shall be required daily for optimum coagulation? The alum dose is 40mg/l	6
(c)	Describe with diagram on JAR Test for estimating optimum coagulant doses.	4
Q4.		
(a)	Discuss the theory of an Ideal Settling Basin. What is its significance?	5
(b)	With the help of a neat sketch explain the operation principle of rapid gravity sand filter. Show different valves for operation of the filter	6
(c)	Explain the action of chlorine for disinfection of water. What do you mean by Breakpoint Chlorination ?	5

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B.CIVIL ENGG. 3rd YEAR 1ST SEM. SUPPLEMENTARY EXAMINATION 2017

WATER SUPPLY ENGINEERING

Full Marks 100

Time: Three hours (50 marks for each part)

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)

Q.1. Write short notes on the following (any four): (4×5) = 20

I. Mention the unit of measurement, acceptable limit, permissible limit and effect / disease of the following parameters of drinking water as per IS 10500: 2012 standard: i) Nitrate; iii) Alpha particle

II. Discuss about the ISO formula for the estimation of fire demand

III. Describe the significance of rainwater harvesting in Indian perspective

IV. Describe the factors affecting the losses of water

V. Test for the Most Probable Number (MPN) of microorganisms in drinking water

VI. Discuss the advantages and disadvantages of 'radial system' and 'ring main system' of water distribution networks

VII. Discuss the assumptions of equivalent pipe method of water supply network design

Q.2.

Deduce the equation for 'incremental 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 2018, it is required to estimate the population of 30 years and also the intermediate population of 15 years after 2018.

Year	1961	1971	1981	1991	2001	2011
Population	41,000	59,000	75,000	99,000	124,000	157,000

Project the population by 'incremental increase method' and 'arithmetic increase method' and also show the % change of population projection between these methods.

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Q.3.

Compare the capacity of a storage reservoir required for balancing the variable demand for the following two situations and given data.

Pumping hours:

Case I : The pumping to the reservoir is to be done at a constant rate throughout the 24 hours.

Case II : The pumping to the reservoir is to be done 8 h., from 6 AM to 10 AM, and again 2 PM to 6 PM.

Design population : 2,40,000; Rate of water supply: 100 lpcd.

Hourly demands are as follows:

Periods of day in h	% of Average hourly flow	Periods of day in h	% of Average hourly flow
11 PM – 5 AM	30	12 Noon – 1 PM	150
5 AM – 7 AM	50	1 PM – 2 PM	160
7 AM – 8 AM	90	2 PM – 5 PM	80
8 AM – 11 AM	250	5 PM – 6 PM	200
11 AM – 12 Noon	90	6 PM – 8 PM	100
		8 PM – 11 PM	80

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Q.4.

A water supply system consisting of an underground reservoir with lift pump at 'A' (R.L. of G.L. 191m), withdrawal point at 'B' (R.L. of G.L. 200m) and elevated balancing storage tank at 'C' (R.L. of G.L. 203m). 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	1400	300
BC	1000	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 32m above G.L. Water is supplied by the lift pump at 'A' with a discharge head of 60m 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

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