Ref No. –EX/CE/ T/312/2018 (S)

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2018
III RD YEAR, 1ST Semester **SUPPLEMENTARY** 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
	Answer Question No 1.(Compulsory) and any three(3) from the rest.	
	Assume relevant data if necessary.	
Q1.	Answer any four (4) from the following:-	
a)	Filter backwashing requires more water velocity than the gravity filtration rate and it also requires air. – justify.	
b)	Aeration and adsorption are employed in specific water treatment plants – why?	
c)	Why alkalinity is a key governing factor for active floc formation of some coagulant?	
d)	For effective disinfection, chlorination would be dependent on pH of water- explain clearly.	
e)	Depth of the settling tank does have significant effect on the removal efficiency of the tank- justify the statement.	
f)	Breakpoint dosage of chlorine is desired for human health—justify	4x3=12
Q2.		
a)	Draw a neat flow diagram showing different units for rendering fit for drinking purpose considering river is the source of water. Raw water shows presence of organics and dissolved gases. Justify the purpose of providing the each unit.	10
b)	Draw and Explain an ideal settling basin for removal of settle able discrete particles.	6
Q 3.		
a)	A Coagulation –sedimentation plant clarifies to supply27 MLD of water. The raw water contains an alkalinity equivalent of 12mg/l CaCO3. The filter alum requires a dose of 40mg/l. Determine the filter alum quantity and the quick lime (containing 80% CaO) to be required per day for treating the water considering 3% loss of water in the plant. The plant operates 18 hrs including 30 minutes backwashing time. Take Al=27, Ca=40, S=32. C=12.	7

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No. of Questions	Part I (Marks:60)	Marks
	b) Find the overflow rate (SOR) in an ideal settling tank for removal of particle size 0.30 mm diameter that will be completely settle with specific gravity 2.65 in water at 20 °C . Assume $\mu = 1.002 \times 10^{-3}$ N.S/m^2 .Deduce the necessary equation for solving the problem.	9
Q4.		
	a) What do you understand by filtration of water? What are the different mechanisms of filtration of water?	2+4
	b) Why dirty skin is beneficial for achieving more bacterial removal efficiency in slow sand filter?	3
	c) With the help of a neat sketch explain the operation principle of rapid gravity sand filter. Show different valves for operation of the filter	7
Q 5.		
	a)	

Sample nos	Chlorine applied doses mg/l	Residual chlorine, mg/l
1	0.2	0.19
2	0.4	0.36
3	0.6	0.50
4	0.8	0.48
5	1.0	0.20
6	1.2	0.40
7	1.4	0.60
8	1.6	0.80
9	1.8	1.00

	b) Draw the chlorine demand curve from the data given above. Determine also breakpoint dosage. What is the chlorine demand at dosage of 1.3mg/l.	9
	Laboratory test on a sample of water indicate that a chlorine dose of 1.8 mg/l is to be used in order to destroy 99.90% of pathogen in a contact time of 20 min. It is decided that hypochlorite with 28 % available chlorine shall be used to obtain 99.99 % kill of pathogens in a contact time of 30 mins. Estimate the amount of the hypochlorite (60%pure) required for treatment of 7500m^3/day of water. Assume n=1.2.	7

Ref No. – EX/CE/T/312/2018(S)

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

WATER SUPPLY ENGINEERING

Time: Three hours

Full Marks 100
(40 marks for this 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): (4×4) = 16

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; and ii) Arsenic

II. Describe the CPHEEO recommendation to meet the fire demand.

III. Distribution of Earth's fresh water

IV. Describe the factors affecting the losses of water

V. Describe the significance of coliform bacteria as pathogen indicator.

VI. What are the advantages and disadvantages of 'dead end system' and 'ring main system' of water distribution networks?

VII. Describe the estimation of the capacity of a distribution/service storage reservoir for balancing the variable demand of water.

Q.2.

Deduce the equation for 'Geometric increase method' of population projection and with this method, solve the following problem.

The populations of a town as per the Census records are given below for the years 1951 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	1951	1961	1971	1981	1991	2001	2011
Population	41,650	42,250	60,550	76,350	98,950	123,550	158,850

Q.3.

For the water supply of a small rural town with the daily requirement of 3,00,000 litres, it is proposed to construct a distribution reservoir. The pattern of draw off is as under:

7.00 A.M. – 9.00 A.M. (30% of day's supply)
9.00 A.M. – 5.00 P.M. (35% of day's supply)
5.00 P.M. – 7.00 P.M. (30% of day's supply)
7.00 P.M. – 7.00 A.M. (5% of day's supply)

The pumping option is: 7 A.M. to 11A.M. and 2 P.M. to 6 P.M. at a constant rate. Find out the size of the reservoir.

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Q.4.

A system of pipe network as shown below carries a total flow of 3 m^3/min from A to C. Compute the total head-loss between A and C using equivalent pipe method. Consider Hazen-William's constant 'C' for all pipes as 100.

Pipe segment	Length (m)	Diameter (mm)
AB	700	300
BC	400	250
AD	475	250
DC	450	280

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