Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3161306 Date:14-12-2022

Subject Name:Design of water Treatment Units

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Explain the importance of alkalinity in coagulation along with chemical reaction.	**03**
	(b)	Explain the terms SOR and detention time along with their importance in design of sedimentation tank.	**04**
	(c)	Draw a neat sketch of water treatment plant for ground water source and explain the different units.	**07**
Q.2	**(a)**	Explain Breakpoint Chlorination with graph	**03**
	(b)	Define effective size and uniformity coefficient and explain their use in design of RSF.	**04**
	(c)	Enlist and explain the parameters which should be kept in mind while selecting the water treatment units.	**07**
		OR	
	(c)	A bar screen is inclined at 60˚ from the horizontal. The circular bars have a diameter of 20 mm. Determine the headloss when the bars are clean and the velocity approaching the screen is 1 m/s.	**07**
Q.3	**(a)**	Differentiate between orthokinetic and perikinetic flocculation.	**03**
	(b)	What is the volume required for a rapid mix basin to be used to treat 0.05m3/s of water if detention time is 1 minute? Also find out the power input if the water temperature is 20˚ C and velocity gradient is 700 s-1. Take μ =1.002 x10-3 N-s/m2	**04**
	(c)	Design the flocculator and check for Gxt for design flow of 18 MLD. Assume following data : Detention time = 30 minutes Depth of flocculator = 3.5 m Velocity gradient = 30 s^{-1}	**07**
		OR	
Q.3	**(a)**	Write the design criteria for coarse screen.	**03**
	(b)	If a 1.0 m^3/s flow water treatment plant uses ten sedimentation basins with an overflow rate of 15 $m^3/m^2.d$, what should be the surface area of each tank ?	**04**
	(c)	Design a tube settler module of rectangular cross section with following data : Design flow =1.7 MLD Diameter of tube = 50 mm. Length of tube = 1.0 m. Angle of inclination = 60˚ to horizontal.	**07**

Q.4	**(a)**	Write the sources and composition of sludge generation from drinking water treatment plant.	**03**
	(b)	Explain the necessity of recovery of water treatment chemicals from the sludge.	**04**
	(c)	Design RSF system for a town of 1.2 lakh population . The rate of water supply is 200L/ca-day. Take peak factor 1.5. Design : (i) Dimensions of filter bed (ii) Size of sand bed. (iii) Size of gravel bed	**07**

OR

Q.4	**(a)**	What are the sources of liquid residuals from water treatment plant?	**03**
	(b)	Explain why it is necessary to reduce the volume of sludge generated in water treatment plant.	**04**
	(c)	Design the under drainage system of RSF for filter length 6.25m and breadth 4.0 m. Assume necessary data.	**07**
Q.5	**(a)**	Write a short note on activated carbon filter for drinking water.	**03**
	(b)	Explain the advantages of Nalgonda method over adsorption method for fluoride removal.	**04**
	(c)	Write down the Fe and Mn removal by oxidation method along with chemical reaction	**07**

OR

Q.5	**(a)**	Write a short note on Arsenic removal by adsorption.	**03**
	(b)	Explain Cascade aeration with the help of neat sketch .	**04**
	(c)	Enlist the methods for water softening and explain any one in detail.	**07**

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