Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161306 Date:17-05-2024

Subject Name:Design of water Treatment Units

Time:10:30 AM TO 01:00 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)**	Draw the conventional surface water treatment diagram and explain each unit in detail .	**03**
	(b)	Define following parameters with its importance in design of sedimentation unit. (i) SOR (ii) WOR (iii) Scour Velocity (iv) Detention Time	**04**
	(c)	Explain the Nalgonda Techniques for fluoride removal from ground water. Also explain advantages and disadvantages of Nalgonda Technique.	**07**
Q.2	**(a)**	Write the applications of Fine Screen and Coarse Screen for drinking water treatment plant	**03**
	(b)	Design of Rapid Mixer for design flow of 18 MLD.	**04**
	(c)	Design a tube settler module of square cross section with following data Design flow = 2 MLD Dimensions of tube = 50 mm x50mm Length of tube = 1 m Angle of inclination = 45°	**07**
		OR	
	(c)	Calculate number of chlorine cylinders required for chlorination unit for 500 MLD drinking water treatment plant. Assume standard values.	**07**
Q.3		Design a Clariflocculator for design flow of 10 MLD. Assume the following data: i. Detention time for flocculator = 25 minutes ii. Height for flocculator = 3 m iii. Area of paddles= 20% of sectional area of plane iv. G= 30 $second^{-1}$ Detention time for clarifier = 2.5 hours	**14**
		OR	
Q.3		Design a rectangular sedimentation tank to remove suspended solids from average flow of 10000 m^3/d. Assume surface overflow rate is 35 m^3/m^2-d and depth of tank is 3.5 m. Check for WOR and Detention time.	**14**
Q.4	**(a)**	For a flow of 1 m^3/s , how many RSF bed of area 12 m x 24 m are needed for a filtration rate of 100 m^3/ m^2- d ? Also find depth of Sand bed , Gravel Bed and design under drainage system.	**14**

OR

Q.4 **(a)** Design a bar screen for a Average flow of 20 MLD. Assume following conditions: **14**

i. Diameter of sewer = 1.5 m
ii. Depth of flow at peak design flow = 1 m
iii. Velocity at peak design flow = 0.8 m/s
iv Drop of screen chamber flow with respect to sewer invert = 0.08 m

Q.5 **(a)** Draw a neat sketch of parshall flume and indicate different components in the figure. **03**

(b) Draw a neat sketch of Cascade Aeration and explain in detail. **04**

(c) Enlist and explain control methods of iron and manganese from ground water **07**

OR

Q.5 **(a)** Enlist the sources of residuals generates from the drinking water treatment plant. Also write its physical characteristics. **03**

(b) Write a short note on Management of sludge and liquid residue. **04**

(c) Make up a bar diagram in terms of calcium carbonate for a water with following composition: **07**

Ca^{+2} = 115 mg/L
Mg^{+2} = 4.75 mg/L
Na^{+} = 14 mg/L
HCO_3^{-} = 235 mg/L
SO_4^{2-} = 88.4 mg/L
Cl^{-} = 21.3 mg/L

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