Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - IVth Semester–Examination – May- 2012

Subject code: X40601

Subject Name: Environmental Engineering

Date:08/05/2012 **Time: 02:30 pm – 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.**

Q.1 **(a)** Explain the theory of plain sedimentation for water treatment process and derive the equation for settling velocity for discrete particles when Reynold's No. is 1 to 1000 and particle size is varying from 0.1 to 1 mm diameter. **07**

(b) Find the settling velocity of a spherical silica particle of Sp. Gr. = 2.67 in water at temperature of 28^0 C if the diameter of particle is 0.015mm.Take the kinematic viscosity of water at 28^0 C= $85x10^{-2}$ cm^2/s. **07**

Q.2 **(a)** Explain the terms: (i) Detention time, (ii) Overflow Rate and (iii) Hydraulic Loading. Also explain the variation in the demand of water. **07**

(b) What is population forecast? Why it is needed for the design of either water or waste water treatment plant? State the different methods of forecasting the future population and explain any one in detail **07**

OR

(b) Why coagulants are added to raw water? State the reasons for using alum salt as coagulant universally. **07**

Q.3 **(a)** Explain: (i) Break down and (ii) Equalizing storages for determining the storage capacity of elevated service reservoirs. **07**

(b) Explain the mass curve method to find the balancing storage of an elevated service reservoir. **07**

A town with a population of 50,000 has a continuous water supply. Average water supply is 180 lpcd, water is being supplied by direct pumping. The total supply of water during the day is distributed percentage wise as follows:

Time	%
5am to 11am	45
11am to 3pm	25
3pm to 9pm	15
9pm to 12midnight	10
12midnight to 5am	05

Water is supplied from the treatment plant at a uniform rate of 3.75million lit/hr for all 24 hours. Find out the capacity of the reservoir required for the distribution of water. Adopt analytical method to find the storage capacity. Assume no loss or draw from the trunk main.

OR

Q.3 **(a)** State and explain the theory of filtration. State the cleaning process of Rapid Gravity Filters. **07**

(b) Design the approximate dimensions of a set of rapid gravity filters for treating water required for a city having the population of 1, 00,000. The rate of supply being 160 lpcd. The rater of filtration of water is assumed as 5,000 lit/hr/sq.m. Assume other additional data if required. Take maximum demand = 2.5 times the **07**

average demand.

Q.4	**(a)**	State the different factors affecting the selection of a pump. Where does sewage pumping differ from water pumping activity?	**07**
	(b)	A town has a population of 80,000. The average water supply rate is 150lpcd. Assuming 80% of water reaches the sewage pumping station; determine the BHP of pumping unit if the sewage is to be pumped against a head of 6.0mt. The length of rising main is kept as 250 m with f=0.02. Assume (i) Maximum demand =2.5 times the average demand (ii) Velocity in rising main = 1.0 m/s (iii) Minimum time of continuous pumping = 20 minutes. (iv) Loss of head in valves, bends etc = 0.5m. (v) Efficiency of pumps and motors = 75% and 85% respectively. Find the BHP for maximum demand of water only.	**07**

OR

Q.4	**(a)**	What is nitrification? Discuss the effects of pH, DO and temperature on it.	**07**
	(b)	Discuss the different methods for disposal of septic tank effluent. Calculate the bottom area of trenches for septic tank when effluent maximum discharge is 1.0 lit/sec and standard percolation time of 36 minutes.	**07**
Q.5	**(a)**	Explain the terms: (i) Dry weather flow and (ii) Wet weather flow. Draw a labeled diagram of drop manhole.	**07**
	(b)	Calculate the velocity of flow and corresponding discharge in a sewer of a circular section having diameter = 1 m laid at a gradient of 1 in 450. The sewer runs at 0.7depth. Use Manning's formula. Take N = 0.015.	**07**

OR

Q.5	**(a)**	Explain why preliminary treatment is being given to the waste water? Write design criteria for horizontal flow grit chamber.	**07**
	(b)	A grit chamber is to be designed with a proportionate flow weir at its outlet to handle a sewage flow for a city having population of 80,000 and per capita daily consumption of water is 140 liters. Assume maximum flow = 2.5 times the average flow. Take detention period of grit chamber = 1 minute, the depth of flow = 1.2 m and free board of 0.3 m. Assume other additional data if required.	**07**

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