Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 731701   **Date: 28-11-2013**
Subject Name: Design of Water And Wastewater Treatment
Time: 10.30 am – 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.**

Q.1 **(a)** Give a brief list of various constituents of wastewater. Write a note on various physical properties of wastewater.   **07**

(b) State and describe four important tests that may be carried out to know the characteristics of sanitary sewage. Distinguish between aerobic , anaerobic and facultative microorganisms and their role in the decomposition of sewage.   **07**

Q.2 **(a)** Discuss the variation in rate of sewage. what are its effects on the design of treatment units?   **07**

(b) Mention various methods of wastewater disposal. Discuss their merits and demerits. Explain the conditions favourable for their adoption.   **07**

OR

(b) A   wastewater effluent of 560 l/s with a BOD=50 mg/l, DO=3.0mg/l and temperature of 23°C enters a river where the flow is $28m^{3}$/s, and BOD = 4.0mg/l, DO=8.2 mg/l, and temperature of 17°C. K_1 for waste is 0.1 per day at 20°C. The velocity of water in the river downstream is 0.18m/s and depth of 1.2m. Determine the following after mixing of wastewater with the river water: (i) Combined discharge (ii) BOD (iii) DO and (iii) Temperature.   **07**

Q.3 **(a)** Write a short note on racks and screens.   **07**

(b) A grit chamber is designed to remove particles with a diameter of 0.2 mm and specific gravity 2.65, for an average working temperature of 20°C. A flow through velocity of 0.25m/s will be maintained by providing a proportional flow weir. Determine the channel dimension for a maximum wastewater flow of $12000m^{3}$/day.   **07**

OR

Q.3 **(a)** What do you understand by sedimentation of wastewater? Describe in brief various types of settlings.   **07**

(b) Design a suitable bar screen for a plant treating a peak flow of 50 million litres per day of sewage. Also, compute the head loss through such a screen.   **07**

Q.4 **(a)** Describe in brief various units operations for chemical clarification along with the design recommendations.   **07**

(b) Differentiate clearly between attached growth process and suspended growth process. list various treatment techniques falling under each such process.   **07**

OR

Q.4 **(a)** Compare, in a tabular form, low rate and high rate trickling filters.   **07**

(b) Write short notes on (i) Tapered aeration process (ii) Extended aeration process   **07**

Q.5 **(a)** Design an oxidation pond for treating domestic sewage of 1200 persons supplied with 150 litres per capita water per day. The BOD and the suspended solids are each of 180 mg/l. Permissible organic loading for pond is not less than 500kg/ha/day. The detention period is not to exceed 6 days. Assume the width of the pond to its length as 1:2 and the operational depth as 1.2. Assume   **07**

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any other suitable data.

(b) What do you understand by digestion of sludge? Differentiate between anaerobic and aerobic digestion. Explain the mechanism of anaerobic digestion. **07**

OR

Q.5 **(a)** Design an anaerobic sludge digester for 120000 persons for digesting mixed raw and activated sludge. **07**

(b) What is land treatment? Discuss the conditions under which it is suitable. **07**

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