

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3171306

Date: 01/06/2026

Subject Name: Wastewater Engineering

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) Define the following terms: domestic wastewater, municipal wastewater and industrial wastewater. **03**
 - (b) Compare domestic wastewater and industrial wastewater with suitable points. **04**
 - (c) Design coarse screen chamber for average flow of $0.7 \text{ m}^3/\text{s}$ sewage. Use following data: **07**
Peak factor = 2.5, Velocity through screen at peak flow = 0.8 m/s , Clear spacing between bars = 40 mm , Thickness of bars = 10 mm , Inclination of bars with horizontal = 60° , Depth of flow = 1.0 m .
- Q.2**
- (a) State the characteristics of municipal wastewater. **03**
 - (b) Write various empirical formulas for head loss through coarse and fine screen. **04**
 - (c) Design an aerated grit chamber for the treated of municipal wastewater. The average flow rate is $0.5 \text{ m}^3/\text{sec}$ and peaking factor is 2.75. **07**
- OR
- Q.2**
- (c) Assuming suitable design criteria design a circular PST for the following: **07**
Total average flow = 60 MLD; Peak factor = 2.25; Suspended solids = 350 mg/L ; No of units = 3 and SWD = 3.2 m
- Q.3**
- (a) Explain the function of coarse screen in wastewater treatment plant. **03**
 - (b) Analyze causes and remedies of grit carryover in grit chamber. **04**
 - (c) Calculate aeration tank volume for Activated Sludge Process treating flow of $0.15 \text{ m}^3/\text{s}$, influent BOD = 85 mg/L , effluent BOD = 20 mg/L , MLSS concentration in aeration tank = 2500 mg/L and F/M ratio = 0.3 day^{-1} **07**
- OR
- Q.3**
- (a) Differentiate horizontal grit chamber and aerated grit chamber. **03**
 - (b) Evaluate in-line and off-line equalization basins for varying wastewater flow. **04**
 - (c) Analyze operational problems and corrective measures of waste stabilization pond. **07**
- Q.4**
- (a) Explain the types of aeration systems used in Activated Sludge Process. **03**
 - (b) Explain the sequence of fill, react, settle and decant stages in SBR. **04**

- (c) Estimate the size of a septic tank (length to width ratio = 2.25, liquid depth = 2 m with 300 mm freeboard), desludging intervals in years, and the total trench area (m^2) of the percolation field, for a small colony of 300 people. Assume water supply of 100 lpcd, sludge production of $0.04 \text{ m}^3/\text{capita}/\text{year}$, and the retention time of 3 days at start up. Desludging is done when the tank is one third full of sludge. A percolation test indicated an allowable hydraulic loading of $100 \text{ L}/\text{m}^2/\text{day}$. **07**

OR

- Q.4** (a) Justify the need of secondary clarifier in Activated Sludge Process. **03**
(b) Compare Sequencing Batch Reactor with conventional ASP. **04**
(c) Evaluate use of Bio-Tower and Rotating Biological Contactor for municipal wastewater treatment. **07**

- Q.5** (a) State any three operational problems of UASB reactor. **03**
(b) Explain briefly about basic processes for sludge treatment. **04**
(c) Assume the following design criteria and conditions for digesting the sludge generated from a 10 MLD domestic wastewater treatment plant having 60% SS removal efficiency of primary clarifier and 250 mg/L suspended solids in wastewater, determine the capacity of the anaerobic sludge digester. Moisture content of primary sludge = 96 %, Initial volatile solids content in sludge = 70 %, Specific gravity of primary sludge = 1.03, Density of water = $1000 \text{ kg}/\text{m}^3$ and Mean cell residence time = 10 days **07**

OR

- Q.5** (a) Explain the purpose of sludge drying beds. **03**
(b) Recommend suitable sludge dewatering unit between drying bed and filter press with reasons. **04**
(c) Design sludge drying bed for population of 50,000 served by SBR based treatment plant. Assume other suitable data. **07**
