

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VII EXAMINATION – WINTER 2025

Subject Code:3171406

Date:01-12-2025

Subject Name:By-Product Utilization and Management

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) Define waste stabilization. **03**
 - (b) Discuss the method of conversion of food waste into useful energy. **04**
 - (c) An aerated lagoon has a uniform influent loading of 330 g/m^3 throughout the year. Calculate effluent BOD_5 value on peak summer and peak winter days. The standard value of k at 20°C is 2.77 day^{-1} . Take peak summer and winter temperatures as 45°C and 10°C respectively. **07**

- Q.2**
- (a) Give waste water characteristics. **03**
 - (b) Explain in the operation of AASP for waste water treatment with the help of neat flow diagram. **04**
 - (c) An AASP waste stabilization plant is operating under following conditions: **07**
Influent flow rate = $12,000 \text{ m}^3/\text{day}$
 - (i) Specific micro-organism yield = $0.50 \text{ kg MLVSS/kg BOD}_5$
 - (ii) MCRT = 12 days
 - (iii) Specific micro-organism decay constant = $k_d = 0.04/\text{day}$.
 - (iv) NHRT = 10 hours
 - (v) Influent $\text{BOD}_5 = 300 \text{ mg/l}$
 - (vi) Mode: completely mixed flow modeCalculate the minimum concentration of the micro-organisms required to be present in the reactor to make the BOD_5 of the treated effluent zero.

OR

- (c) A sample of waste water was subjected to laboratory analysis. The following data are available: **07**
Sample volume: 300 ml, Total suspended solids = 180 mg/l , BOD_5 value = 400 mg/l , Tare mass of crucible and filter = 65.4 g , Mass of crucible and filter after decomposition at 600°C = 65.44 g .
Calculate the following:
 - i. Mass of suspended solids in g. (ii) Volatile suspended solids in mg/l .
 - ii. Ultimate BOD in mg/l if $k = 0.13/\text{day}$.

Q.3	(a) Define BOD, BOD ₅ and COD of waste water.	03
	(b) Discuss in detail the methods of water treatment to prevent boil corrosion and scale formation in food processing vessels.	04
	(c) Explain the following briefly: Diffused aerators (ii) Facultative ponds	07
	OR	
Q.3	(a) An aerated lagoon has to operate with influent BOD ₅ value of 200 g/m ³ year round. Calculate the effluent BOD ₅ each on typical winter (11 °C) and summer days (25 °C). Take k (at 20 °C) = 2.5/day.	03
	(b) Describe various methods for solid waste disposal.	04
	(c) Explain the following: (i) Anaerobic waste stabilization (ii) Aerated lagoons	07
Q.4	(a) What is gasification? Describe different zones in gasification process and give the reactions occur in gasification process.	03
	(b) Explain Diffused aerators with the help of neat diagram.	04
	(c) Explain the significance of following parameters vis-à-vis effluent treatment: Chlorides content, p-H value, Surfactants and Nitrates.	07
	OR	
Q.4	(a) Describe rinse and swab method in detail and list its applications.	03
	(b) Explain the following: (i) Significance of $\frac{COD}{BOD_5}$ ratio (ii) Imhoff cone	04
	(c) A 20% dilution sample of a certain effluent was put to standard BOD test. The following data was recorded: DO of the original effluent = 4 mg/l DO of the seed water used = 8mg/l DO of diluted sample after 5-days = 1.0 mg/l k = 0.18/day at 20 °C Calculate (i) BOD ₅ of the sample in mg/l (ii) Ultimate BOD in mg/l (iii) BOD remaining after 12-days in mg/l	07
Q.5	(a) How is whey utilized from dairy industry?	03
	(b) Answer the following: i. State methods of sanitization. ii. What are the factors which affect the efficiency of sanitization?	04
	(c) Explain the principle, construction and operation of “Trickling Filters”?	07
	OR	
Q.5	(a) Define Bio-gas and give main components of biogas?	03
	(b) Give criteria for selection of detergents?	04
	(c) Write brief notes on the following giving examples: (i) Process Reactors (ii) Sterilization of cans	07
