Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E / B. TECH (FULL TIME) ARREAR EXAMINATIONS APRIL/MAY 2024
DEPARTMENT OF CIVIL ENGINEERING

CE5503 - WASTEWATER ENGINEERING
(Regulation – 2015/2019)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART- A (10 x 2 = 20 Marks)

Q.No	Questions	Marks
1.	What is meant by Separate sewage system and Combined sewage system	2
2.	What is Self-cleansing velocity in sewer design?	2
3.	Write the difference between Unit operation and Unit process?	2
4.	Define Suspended growth treatment process?	2
5.	Define MLSS and MLVSS. Explain the difference between them.	2
6.	Explain the advantages of onsite sanitation.	2
7.	What are the advantages and disadvantages of UASB?	2
8.	List the factors affecting the self-purification of river.	2
9.	Write the stages that occur during the anaerobic digestion	2
10.	What is sewage sickness?	2

PART- B (5 x 13 = 65 Marks)

Q.No	Questions	Marks
11(a)	i)Design a sewer to serve a population of 50,000;the daily per capita water supply allowance being 135 litres, of which 80% finds its way into the sewer . The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the dry weather flow when running full. What would be the velocity of flow in the sewer when running full? Assume n= 0.012 in Manning's formula (7). ii) Explain any three parameters of sewage characteristics (6).	13
	(OR)	
11(b)	i) Derive the first order BOD reaction (7). ii)For a sample of sewage, 5-day BOD at 20°C is 250 mg/L and its 67% of the ultimate BOD. What will be its 4-day BOD at 30°C (6).	13
12(a)	Design and draw a primary settling tank for a town having a population of 75,000 with a water supply of 70 litres per capita per day. Assume 90 % of water supplied to the city is converted into sewage.(13)	13
	(OR)	
	A rectangular grit chamber is designed to remove particles with a diameter of 0.2mm, specific gravity 2.65, settling velocity for these	13

12(b)	particles has been found to be range from 0.016 to 0.022m/sec , depending on their shape factor .A flow through velocity of 0.3 m/sec will be maintained. Determine the channel dimension for a maximum waste water flow of 10,000 cu m/day.(13)	
13(a)	i) What is meant by waste stabilization pond. Discuss the classification of waste stabilization pond (10) ii) Define Organic Loading Rate (OLR) and Hydraulic Loading Rate (HLR) (3).	13
	(OR)	
13(b)	b) Draw and determine the size of a high -rate trickling filter for the following data sewage flow = 20 MLd, recirculation ratio=1.5, BOD of raw sewage =550 mg/l, BOD removal in primary clarifier =40 %, final effluent BOD desired = 20 mg/l (13).	13
14(a)	i)Explain the mathematical analysis of oxygen sag curve by Streeter Phelps equation (10). ii)Explain the method of disposal of wastewater by land treatment. (3)	13
	OR	
14(b)	b) i) Explain the zones of pollution in river.(6) ii) A city discharges treated sewage effluent at 100 m^3 into river flowing at 1000m^3 with a mean velocity of 0.2m/s . The BOD_5 of sewage and river water at 20°C are 20mg/L and 1.5 mg/L respectively. The upstream DO is 7.8 mg/L at a temperature of 20 °C . The constant of K_1 (Deoxygenation rate constant) and K_2 (Reaeration rate constant) to base are 0.15/day and 0.40/day respectively. Calculate the critical time (t_c) where the minimum DO will occur. The distance (X_c),where this will occur and the minimum DO concentration.(7)	13
15(a)	i) Design a sludge drying beds for digested sludge obtained from low rate anaerobic digester for digesting a mixture of primary and excess activated sludge. The capacity of the activated sludge plant is 50,000 m^3/day, volume of digested is 229m^3/day and sewage flow may be assumed as 180 lpcd. ii) Explain the methods of final disposal of sludge.	13
	OR	
15(b)	i) What is meant by anaerobic digestion? Explain the mechanism involved in anaerobic digestion process (7). ii) What is meant by sludge thickening (or) concentration process). What are the three methods involved in sludge thickening process.(6)	13
	PART- C **(1X15=15)**	
16)	Design and draw a septic tank for a hostel with the following data :Nos. of users =150, peak discharge =432Lpm, desludging period =1 year. Assuming the percolation rate as 10minutes/cm. Design a dispersion trench for the	15