Ref. No. ***Ex/PG/CIV/PE/T/114B/2025***

M.E. CIVIL ENGINEERING FIRST YEAR FIRST SEMESTER EXAM 2025

Subject: WATER POLLUTION AND CONTROL **Time: Three Hours** **Full Marks: 100 (60 for Part I)**

Part-I

Use a Separate Answer-Script for Each Part

Answer any 3 (three) questions

(Assume logically any data necessary but not given)

1.	(a)	Define Biochemical Oxygen Demand (BOD).	3
	(b)	Describe the process of unseeded and seeded 5-day BOD test with relevant equations.	7
	(c)	A 10.0 mL sample of sewage mixed with enough water to fill a 300 mL bottle has an initial DO of 9.0 mg/L. To help ensure an accurate test, it is desirable to have at least a 2.0-mg/L drop in DO during the five-day run, and the final DO should be at least 2.0 mg/L. For what range of would this dilution produce the desired results?	5
	(d)	A test bottle containing just seeded dilution water has its DO level drop by 1.0 mg/L in a five-day test. A 300-mL BOD bottle filled with 15 mL of wastewater and the rest seeded dilution water (sometimes expressed as a dilution of 1:20) experiences a drop of 7.2 mg/L in the same time period. What would be the five-day BOD of the waste?	5
2.	(a)	Deduce the expression for 'Critical Time' about the classic *Streeter-Phelps Oxygen Sag Equation*.	6
	(b)	What is the 'Purification Factor' (f)? Deduce how the 'Critical Time' (t_c) could be expressed in terms of the 'Purification Factor'.	8
	(c)	Just below the point where a continuous discharge of pollution mixes with a river, the BOD is 10.9 mg/L, and DO is 7.6 mg/L. The river and waste mixture has a temperature of 20°C, a deoxygenation constant of 0.20/day, an average flow speed of 0.30 m/s, and an average depth of 3.0 m. Find out: (i) Time and distance downstream at which the oxygen deficit is at a maximum. (ii) The minimum value of DO.	6
3.	(a)	Deduce the modified *Streeter-Phelps Oxygen Sag Equation* as proposed by 'Thomas'.	12
	(b)	With neat diagrams, state the evaluation process of the stream constants as proposed by 'Thomas'.	8
4.	(a)	With a neat diagram, briefly explain the following phenomena in a lake: (i) Winter Stagnation (ii) Spring Overturning (iii) Summer Stagnation (iv) Fall Overturning	8
	(c)	With a neat diagram, deduce the 'Continuity or Conservation of Mass Equation' for mass transport of pollutants for a stretch of a river with variable cross-sectional area. Modify the deduced equations for two-dimensional and three-dimensional flows as well.	12

[Turn over

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Subject: WATER POLLUTION AND CONTROL
Part - II
(40)

Use a separate Answer-Script for each part

No. of Questions	Answer any *Four* Questions	Marks
1 (a)	Write down any **four** important criteria for monitoring station site selection.	[4]
(b)	Describe the different types of **monitoring stations.**	[6]
2 (a)	What are the **objectives** of Water Quality Monitoring?	[5]
(b)	Explain **alarm function, control function, trend function** and **instrument function.**	[5]
3	Describe the four different types of **samples** with respect to water quality monitoring.	[10]
4 (a)	Describe briefly the two types of **Zonation.**	[5]
(b)	Describe the different types of **mixing** in rivers to distribute the contaminants.	[5]
5 (a)	Briefly describe **stagnation** and **overturning** in Temperate lakes.	[5]
(b)	Write down the parameters and frequency of **baseline** monitoring in surface water.	[5]