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**Mid-Term Examinations - November 2024**

**Semester:** 7<sup>th</sup> **Date:** 05-11-2024  
**Course Code:** CIV3030 **Time:** 09.30am to 11.00am  
**Course Name:** Industrial Wastewater Treatment **Max Marks:** 50  
**Program:** B. Tech **Weightage:** 25%

**Instructions:**

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

**Part A**

<b>Answer ALL the Questions. Each question carries 2marks.</b>		<b>5Qx2M=10M</b>		
1	What is Industrial wastewater	2 Marks	L1	C01
2	What is eutrophication	2 Marks	L1	C01
3	Define oxygen sag	2 Marks	L1	C01
4	List four biological treatment methods to remove organic matter.	2 Marks	L1	C02
5	Define Mixed Liquor	2 Marks	L1	C02

**Part B**

<b>Answer ALL Questions. Each question carries 10 marks.</b>		<b>4QX10M=40M</b>		
6	<b>6a</b> Industrial and domestic wastewater are two primary types of wastewater that originate from different sources and contain distinct types of contaminants. List 5 differences between industrial and domestic wastewater.	5 Marks	L2	C01
	<b>6b</b> A stream must be protected so that it can serve the best interests of the people using it. The important approach to protecting streams is by setting Effluent Standards. Write a short note on the effluent standard	5 Marks	L2	C01

**Or**

- 7    **7a**    After the wastewater is discharged into the stream what zones of pollution are observed in the stream                    **5 Marks**    **L2**    **CO1**
- 7b**    Illustrate the oxygen sag curve and explain how oxygen sag analysis is used to assess the depletion and subsequent recovery of dissolved oxygen in water bodies affected by organic pollutants.                    **5 Marks**    **L2**    **CO1**
- 8            A municipal sewage plant discharges 15000 m<sup>3</sup>/day of wastewater into a stream whose rate of flow is 0.5 m<sup>3</sup>/sec.                    **10 Marks**    **L4**    **CO1**

Municipal Discharge	Stream flow
BOD <sub>5,20</sub> = 78 mg/l	BOD <sub>5,20</sub> = 2 mg/l
Temperature 28°C	Temperature 23°C
DO = 2 mg/l	DO = 7 mg/l

The velocity of the mix is 0.3 m/s. The deoxygenation and reoxygenation constant at 20°C is 0.23 and 0.4 per day respectively. The saturation DO is 8.57 mg/l for the stream. Determine the critical DO and critical time.

**Or**

- 9            Treated effluent is discharged into a river. During peak summer conditions, the wastewater has a maximum flow rate of 8,000 m<sup>3</sup>/day, a BOD<sub>5,20</sub> of 45 mg/L, a DO concentration of 3 mg/l, and a temperature of 27°C. Upstream from the discharge point, the river has a minimum flow of 0.6 m<sup>3</sup>/sec, a BOD<sub>5,20</sub> of 2 mg/L, a DO concentration of 7.2 mg/L, and a temperature of 22°C. The mixing of the wastewater and river water is nearly instantaneous, with a flow velocity of 0.18 m/s. The deoxygenation and reoxygenation constant at 20°C is 0.24 and 0.4 per day. The saturation DO is 8.6 mg/l. Calculate the dissolved oxygen profile for 100 km downstream of the discharge point.                    **10 Marks**    **L4**    **CO1**
- 10           A research team was tasked with assessing the health of a river flowing through a small town. Define Stream Sampling. What are the factors that will be considered by the team before starting a stream sampling program                    **10 Marks**    **L3**    **CO1**

**Or**

- 11** Natural bodies of water possess the inherent ability to address pollution and gradually restore their original quality over time. Can you explain the self-purification process in detail? Explain what actions are performed in the process of self-purification in the stream. **10 Marks** **L3** **CO1**
- 12 12a** Industrial wastewater is pre-treated on-site to reduce the harmful effects of effluents on treatment plant systems and surrounding water streams. Explain the Strength reduction pre-treatment technique of wastewater in detail. **5 Marks** **L2** **CO2**
- 12b** Explain in detail how the Volume reduction pre-treatment technique is adopted in reducing the quantity of wastewater. **5 Marks** **L2** **CO2**
- Or**
- 13 13a** How does the trickling filter method work in the biological treatment of wastewater to effectively remove organic pollutants? **5 Marks** **L2** **CO2**
- 13b** Removing dissolved organic matter from wastewater is a critical responsibility for engineers. As an engineer, how would you implement a lagooning technique in an oxidation pond to effectively remove organic matter? **5 Marks** **L2** **CO2**