

**CEL879 Major Examination
INDUSTRIAL WASTE MANAGEMENT & AUDIT
IIT Delhi**

MM: 100 (Part A: 20 + Part B: 80)

Time: 120 min

Part B:

1. An industrial wastewater contains the following: 150 mg/L ethylene glycol ($C_2H_6O_2$), 100 mg/L phenol, 40 mg/L, sulfide (S), 125 mg/L ethylene diamine hydrate ($C_2H_{10}N_2O$ ethylene diamine is essentially non biodegradable)

- (a) Compute the COD and TOC.
- (b) Compute the BOD_5 if the k_{10} is 0.2 d^{-1} .
- (c) After treatment, the BOD_5 is 25 mg/L. Estimate the COD ($k_{10} = 0.1\text{ d}^{-1}$).

[15]

2. Design of MBR for the treatment of textile industry wastewater:

- a) Characteristics of effluent from a textile industry are given in Table 1. Average wastewater generation from this unit is 10 mld. It is proposed to install an MBR based ETP to treat this wastewater. List the important parameters of the MBR which are needed to work out the total cost of the project.
- b) Work out the design. Assume appropriate factors and parameters wherever needed.
- c) Discuss whether the MBR based ETP will be sufficient to remove all the pollutants or some additional unit processes are also to be installed.

BOD_5	COD	pH	Cl^-	Na^+	K^+	$SO_4^{=}$	Mg^{++}	Colour	TDS
1600 mg/L	2500 mg/L	6.2	3000 mg/L	500 mg/L	800 mg/L	600 mg/L	600 mg/L	800 ADMI	8000 mg/L

[20]

3. Explain constructed wetlands as bio-pumps. List the advantages of using Constructed wetlands in industrial wastewater treatment. [10]

4. Why should an industry treat its wastewater? List five most convincing reasons? [5]

5. Industrial waste can be managed using two basic approaches, i.e., "End of Pipe Treatment" and "Pollution Prevention". Explain these approaches with 4 examples of each one. [10]

6. List the design parameters and their values for an UASBR. [10]

7. BOD_5 of wastewater from a pulp and paper manufacturing unit is 3400 mg/L. Determine its Ultimate BOD. [10]