

MASTER OF CIVIL ENGINEERING EXAMINATION, 2019  
FIRST YEAR, 2nd Semester Examination

**SUBJECT: INDUSTRIAL WASTEWATER TREATMENT**

Time: Three hours

Full Marks /100

Use a separate Answer-Script for each part

**Part I**

Answer all the Question

Assume relevant data if necessary

Two (2) marks are reserved for neatness

Q1.

A rubber processing industry discharges ammoniacal liquor with other organic pollutants. The flow rate was found to be 7.5 mld. The BOD<sub>5</sub> and TKN values after primary treatment are found to be 345 and 125mg/l respectively. A combined nitrification cum organic removal has been suggested for proper treatment of the same. The minimum sustainable temperature, DO, and pH are 15<sup>o</sup> c, 2.1mg/l and 7.3 respectively. Following values are obtained from pilot plant studies.

- KO<sub>2</sub>-1.27
- K<sub>dN</sub>-0.04
- Safety factor -2.5
- K<sub>N</sub>-10<sup>0.051T-1.158</sup>
- μ=0.5/d
- MLVSS in the aeration tank=2000 mg/l
- Overall yield including nitrification=0.30
- Activated sludge yield=0.60
- K<sub>d</sub> for carbon utilization=0.06

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Determine the size of the aeration tank, HRT, theoretical volume of air needed for complete removal of organics and nitrification (95% efficiency) with 125% excess air supply. Assume any other data if necessary.

Q2.

a) A pressurized recycled flow floatation system is to be installed for 90% removal of suspended solids from the waste originating in a fruit processing unit. Determine the size of floatation unit from the following :-

- Solids in influent waste - 400 mg/L
- Optimum A/S ratio - 0.05
- Air solubility at 30<sup>o</sup>C-7.8 mg/L
- Wastewater flow rate - 750m<sup>3</sup> /day
- Recycle pressure - 3.0 atm
- Surface loading rate - 85 l/m<sup>2</sup>/min
- "f" value 0.60

10

Assume any data if required.

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b)

Discuss the importance of material and water balance diagram for assessment of industrial wastewater treatment. What are the different streams to be considered for the above?

10

Q3.

a)

What is the necessity of providing an equalization tank? Does the basin can serve as neutralization tank?

b)

Justify Explain briefly the sources of following heavy metals commonly found in trade effluent.

(A) CHROMIUM

(B) COPPER

(C) CYANIDE

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Discuss their solubility condition with respect to pH as occurrence of minimal concentration. What are the effects of above pollutant on human health?

Discuss the removal technology of metal pollution by precipitation method.  
your answer

Use a separate answer-script for each part

No. of Question	Part-II	Marks
<u>Answer Question-1 and any two from the rest</u>		
Q.1) a)	State the basic steps associated with <b>chemical pulping process</b> of pulp manufacturing?	6
b)	What do you mean by “ <b>Pasteurization of Milk</b> ”? How is it carried out in modern dairy plants?	(2+3)
c)	Describe in brief the “ <b>Treatment of Chlorine</b> ” generated by a mercury cell type <b>chlor-alkali industry</b> .	5
Q.2) a)	Describe with the help of <i>neat diagram and pertinent reactions</i> the basic process involved in a typical <b>diaphragm cell chlor-alkali unit</b> .	6
b)	What do you mean by “ <b>Brine Mud</b> ”? How can we perform “ <b>Debrining</b> ” and “ <b>Demercurization</b> ” of the “ <b>Brine Mud</b> ” mercury cell <b>chlor-alkali unit</b> ?	(2+4)
Q.3) a)	Draw a <b>neat process flow chart</b> for a market milk production unit.	4
b)	Discuss in brief on the following activities involved in market milk production unit. i) <b>Clarification</b> ii) <b>Cleaning-in-process system</b>	(2+2)

No. of Question	Part-II	Marks
c)	Discuss in brief on <b>different treatment alternatives</b> recommended by CPCB for modern dairy plants.	4
Q.4) a)	Discuss in brief with necessary justifications on <b>any two treatment alternatives</b> recommended by CPCB for treatment of effluent generated in pulp and paper industry.	4
b)	Draw a <b>neat process flow chart</b> for a typical <b>small-scale bovine slaughter house</b> and mark the potential points of effluent generation.	4
c)	Discuss in brief on the following operations involved in bovine slaughtering process. i) <b>Antemortem Dressing</b>	(2+2)