Ref No. –Ex/PG/CE/T/129E/2017

MASTER OF CIVIL ENGINEERING EXAMINATION, 2017
2nd Semester

SUBJECT: INDUSTRIAL WASTEWATER TREATMENT

Full Marks ~~30~~/100

Time: ~~Two hours~~/Three hours/~~Four hours/ Six hours~~

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks:50)	Marks
	Answer any Three (3) questions Assume relevant data if necessary Two (2) marks are reserved for neatness and to the point answer.	
Q1.		
(i)	Explain briefly the sources of following heavy metals commonly found in trade effluent. (A) Cadmium (B) Nickel (C) Lead Discuss their solubility condition with respect to pH as occurrence of minimal concentration. What are the effects of above pollutant on human health?	6
(ii)	Discuss the removal technology of metal pollution by precipitation method.	
(iii)	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 :- a) Solids in influent waste - 400 mg/L b) Optimum A/S ratio – 0.05 c) Air solubility at 30^0C-7.8 mg/L d) Wastewater flow rate – 750m^3 /day e) Recycle pressure – 3.0 atm f) Surface loading rate – 85 l/m^2/min g) " f" value is 0.60 Assume any data if required.	4 6
Q 2.		
(i)	An industrial unit emanates wastewater with a total flow of 1000m^3 /day. Design an equalization tank on the basis of following data. a) Data collection interval-4hrs b) Average BOD- 470mg/l c) Maximum BOD -825 mg/L d) Effluent BOD must not exceed from equalization tank -680 mg/l e) 84% probability of BOD≤ 7700mg/l f) 16% probability of BOD≤275 mg/l g) 50% probability of BOD≤ 470mg/l h) Depth of the tank - 4.0 m i) Z= 1.65	5

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No. of Questions	Part I (Marks:50)	Mar Q
Q 2.		
(ii)	A rubber processing industry discharges ammonical liquor with other organic pollutants. The flow rate was found to be 7.5 mld. The BOD_5 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 15^0 c,2.1mg/land 7.3 respectively. Following values are obtained from pilot plant studies. a) KO_2-1.27 b) K_{dN} -0.04 c) Safety factor -2.5 d) K_N—$10^{0.051T-1,158}$ e) μ=0.5/d f) MLVSS in the aeration tank=2000 mg/l g) Overall yield including nitrification=0.30 h) Activated sludge yield=0.60 i) K_d for carbon utilization=0.06 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.	11
Q3.		
(i)	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?	4
(ii)	What is the necessity of providing an equalization tank? Does the basin can serve as neutralization tank? Justify your answer.	3
(iii)	What is SVI ? How this parameter is applied for treatment of wastewater? How it is estimated?	4
(iv)	Explain briefly the type of industrial effluent is better suited for its treatment in aerobic and anaerobic environment. Justify your answer.	5

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Mar	No. of Questions	Part I (Marks:50)	Marks
	Q. 4.	A high rate aerator system produces 1140m^3/day of waste sludge. The sludge is wasted directly from the aerator with a solid content of 3300mg/l. the sludge is thickened to 3.0% solid. The thickened sludge is digested in a standard rate anaerobic digester. The digestion period is 30days and storage for 90days. The organic content of the sludge is 75% and 55 % of the remains is converted to gaseous or liquid end product. The solid content of the digester sludge is 6%.Determine and check volatile Solid loading in kg/m^3. day and Gas production Required diameter of Digester. Ht.= 8m Methane Content = 60% Gas production rate = 0.55m^3/ kg VSS added.	16
11			
4			
3			
4			
5			

Form A: Paper –Setting Blank **Ref No.:** Ex/PG/CE/T/129E/2(

M.E. CIVIL ENGG. 1ST YEAR, 2ND SEMESTER EXAMINATION, 2017

(1st / 2nd Semester / ~~Repeat~~ / ~~Supplementary~~ / ~~Annual~~ / ~~Biannual~~)

SUBJECT: INDUSTRIAL WASTEWATER TREATMENT

(Name in full)

Full Marks:

Time: ~~Two hours~~/Three hours/~~Four hours~~/ ~~Six hours~~ (50 marks for this pa

Use a separate answer-script for each part

No. of Question	Part-II	Mark
	Answer Question-1 and any *two* from the rest	
Q.1) a)	State the basic steps associated with **chemical pulping process** of pulp manufacturing?	**5**
b)	What do you mean by **"Pasteurization of Milk"**? How is it carried out in modern dairy plants?	**(2+3)**
c)	State the **pollution abatement measures** recommended for small scale bovine slaughter houses.	**5**
d)	Describe in brief the **"Reduction Method"** for demercurization of wastewater emanating from a **chlor-alkali industry.**	**5**
Q.2) a)	Describe with the help of *neat diagram and pertinent reactions* the basic process involved in a typical **mercury cell chlor-alkali unit.**	8
b)	What do you mean by **"Brine Mud"**? How can we perform **"Debrining"** and **"Demercurization"** of the **"Brine Mud"**?	**(2+2+3**
Q.3) a)	What are the basic reasons behind the **"preservation of milk"?** Describe in brief the **cleaning-in-process (CIP) system** involved in a modern dairy plant.	**(2+3)**
b)	Discuss in brief on the following operations involved in market milk production. **i) Clarification ii) Homogenization**	**(3+3)**

/129E/20Form A: Paper –Setting Blank

Ref No.: Ex/PG/CE/T/129E/2017

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(~~1st~~ / 2nd Semester / ~~Repeat~~ / ~~Supplementary~~ / ~~Annual~~ / ~~Biannual~~)

SUBJECT: INDUSTRIAL WASTEWATER TREATMENT

(Name in full)

Marks: 1

r this pa Time: ~~Two hours~~/Three hours/~~Four hours~~/ ~~Six hours~~

Full Marks: 100

(50 marks for this part)

Mark	No. of Question	Part-II	Marks
	c)	Discuss in brief on **different treatment alternatives** recommended by CPCB for modern dairy plants.	4
5	Q.4) a)	Discuss in brief with necessary justifications on **any two treatment alternatives** recommended by **CPCB** for treatment of effluent generated in pulp and paper industry.	(3+3)
(2+3)			
5	b)	Draw a **neat process flow chart** for a typical **small-scale bovine slaughter house** and mark the potential points of effluent generation.	4
5	c)	Discuss in brief on the following operations involved in bovine slaughtering process.	(2+3)
8		**i) Antemortem ii) Dressing**	

(2+2+3)

(2+3)

(3+3)