Total No. of Questions :10]

SEAT No. :

P4233

[Total No. of Pages :4

[4860]-617-A

M.E. (Civil) (Water Resources and Environmental Engineering)

INDUSTRIAL WASTE MANAGEMENT

(2012 Course) (Semester - II) (Elective -III) (501611)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Attempt any three questions from each sections.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use data sheet.***

SECTION-I

Q1) a) Explain physical, chemical & biological characteristics of industrial waste water. **[8]**

b) The cumulative flow of waste water (W.W.) reaching to CETP in a day varies as shown in table No.1 Determine the capacity of equalization tank for given flow variations. Plot graph of time Vs Cumulative flow.**[8]**

Table No.1 Data for finding capacity of equalization tank

Time Hr.	0	2	4	6	8	10	12	14	16	18	20	22	24
Cumulative flow m^3	0	25	50	75	100	110	130	140	150	165	170	198	220

Q2) a) Explain grab and composite sampling technique. **[8]**

b) Explain techniques for reduction of waste. **[8]**

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Q3) a) Plot the BOD curve and calculate Kt & Lt for the following data. **[8]**

Time days	2	4	6	8	10
BOD mg/L	10	20	23	25	30

b) Explain the concept of self purification of stream. **[8]**

Q4) a) Explain different methods for removal of TDS. **[8]**

b) Design an aerobic sludge digester for Industrial waste water of 10 MLD, quantity of sludge produced = 2000 kg/d, Sp. Gravity = 1.003, Solid concentration = 3.5%, HRT = 15 days, Volatile solids = 80% Find: **[8]**

i) Volume of sludge digested per day.

ii) Volume of sludge digester.

iii) Oxygen required take oxygen requirement as 2 kg/kg-d of volatile solid cell oxidized and 40% cell destroyed.

iv) Volume of air supplied 1.20 x 0.21 kg/m^3.

Q5) a) The BOD of industrial W.W. for 1 day at 30°C has been found to be 110 mg/L. What will be the 5 day BOD at 20°C. Take $K_D(20^oC) = 0.1$. **[9]**

b) Explain the concept of anaerobic sludge digestion with three phases such as hydrolysis, acidogensis, methonagesis and also explain conventional sludge digester with diagram. **[9]**

SECTION-II

Q6) a) The treated W.W. with flow of 2000 L/min is to be treated with PAC to reduced concentration of total organic nitrogen from 5 mg/L to 1 mg/L. The removal follows Freundlich adsorption isotherm in which capacity factor and intensity parameter are 160 mg/gm $(L/mg)^{1/n}$ & 0.5 respectively. Determine PAC dose, PAC requirement and annual cost of PAC. Assume PAC cost to be Rs. 50/- per kg. **[8]**

b) Explain operation and maintenance problem of CETP. **[8]**

Q7) a) Draw a flow diagram for treating W.W. of dairy industry & show all treatment unit. **[8]**

b) Draw a flow diagram for treating W.W. of textile industry and show all treatment unit. **[8]**

Q8) a) Explain the electro dialysis process and determine power required for electro dialysis process for the following data: **[8]**

i) Q = 4000 m^3/d,

ii) TDS = 2000 mg/L,

iii) No. of Cells = 300

iv) Cation and anions concentration = 0.011 Eq/L,

v) Salt removal Efficiency = 50%, Current efficiency = 90%., R = 50 ohm. Use data sheet if required.

b) Explain importance of treatability index in waste water treatment. **[8]**

Q9) a) Explain the characteristics of sugar industrial waste with value and state disposal method of industrial treated waste with flow diagram. **[8]**

b) Write short note on water pollution act 1978. **[8]**

Q10)a) Design CETP for following data **[9]**

i) Q = 150 m^3/d,

ii) pH = 11 - 12,

iii) BOD at 27^oC = 70 mg/L

iv) TDS = 3000 mg/L

v) TS = 6000 mg/L

vi) Iron concentration = 700 mg/L

vii) COD = 5000 mg/L at 27^oC

Find:

1) Volume of sedimentaion tank

2) Acid required for neutralization if 3 lit acid required for 1 m^3/d of E/F pH.

3) Quantity of time required for removal of Iron take lime consumption as 1mg/L of Iron required 0.5 mg/L of lime.

4) Select suitable method for removal of COD and BOD.

5) F/M ratio

b) Write short note on hazardous waste management. **[9]**

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