



Note : Notes: 1- Answer All Questions

2- All Questions have Same Mark (12 Marks)

Q1/ Design two grit chambers with proportional flow weir, if you know the following data:

- P.F = 2.5
- Flow through velocity = 0.3 m/sec
- Quantity of grits = $0.06 \text{ m}^3/1000 \text{ m}^3$ from the average flow .
- Interval of cleaning every 2 days .
- Weir constant a and b are 0.3 m and 0.45 m respectively .
- D.T = 1 min.
- Volume of one chamber = 18 m^3 .
- Settling velocity = 0.015 m/sec .

Q2/

If a waste water flow of ($Q \text{ m}^3/\text{day}$) have a BOD5 of (250 mg/l) enter CMR with recycle, if the quantity of O_2 required is (578410 kg/d) and effluent BOD5 from secondary settling tank is (20 mg/l) and the conversion factor from BOD₅ to BOD_u is (1.5), if you know the settling data shown in the table below was obtained for an activated sludge with an initial solids concentration of (3000 mg/l). The initial height of the inter face in the settling column was at (0.75m). Determine the area required to yield a thickened solids concentration of (12000 mg/l), determine also the solids loading ($\text{Kg}/\text{m}^2 \cdot \text{d}$) and the over flow rate.

Time (min)	0	10	20	30	40	50	60	70	80
Interface height (m)	0.75	0.56	0.41	0.3	0.24	0.2	0.17	0.15	0.14

Q3/

A- The influent organic loading rate for a conventional treatment plant based on activated sludge system with recycle is (19085 Kg COD/d) , if the reactor have dimensions (50,20,4.5)m , and you know that:-

- Effluent flow rate = 21 MLD
- Biomass concentration in reactor = 7000 mg/l .
- Biomass concentration in effluent = 30 mg/L
- Return line flow rate = $15904 \text{ m}^3/\text{d}$.
- SOR and WLR for primary cylindrical settling tank = $30 \text{ m}^3/\text{m}^2/\text{d}$, $225 \text{ m}^3/\text{m}^2/\text{d}$ respectively.

Compute the mean cell residence time and F/M ratio .

B- Define (HRT, WLR and SRT).



Q4/

A- An effluent from PST containing (225 mg/l) of BOD5 is to be treated aerobically in CMR without recycle, compute the design MCRT of biomass in the reactor if you know that $K_s=60 \text{ mg/l}$, $K = 5 \text{ d}^{-1}$, $K_d=0.05 \text{ d}^{-1}$, $Y = 0.5$.

B- A screen chamber with (16 bars of 11mm*50mm with clear spacing 25mm) the depth of water before and after screen bars are (0.4m) and (0.35m) respectively, design one approach channel if Manning coefficient of roughness is 0.013 .

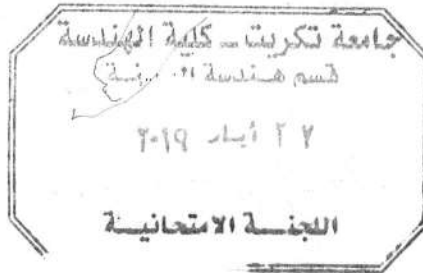
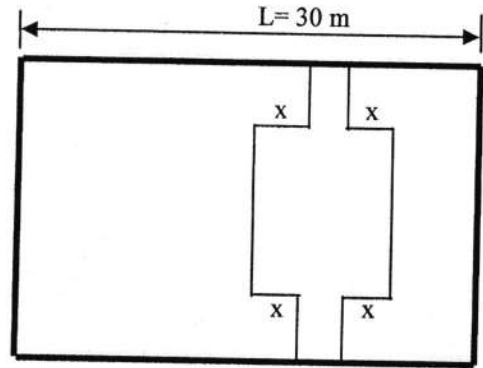


Q5/

A- Answer One only :

- 1- Derive the equation of time needed to reduce the substrate concentration from C_0 to C_e .
- 2- Derive the equation of Michael and Menten .

B- A rectangular clarifier shown below the ratio $L:B = 3:1$, if flow rate ($3750 \text{ m}^3/\text{d}$), find the value of (x) that satisfied weir loading rate ($150 \text{ m}^3/\text{m}/\text{d}$)? what is shape of weir if width of tank (12.5) m?



Good Luck

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