Programme: B. Tech

Course Name: Environmental Engineering - I

Course Code: ECE 358

Tutorial – 3

Topics Covered – Unit 3 (CO3)

Tutorial –3

Assume suitable data wherever necessary

1. Determine the settling velocity of a spherical particle with diameter of 100µm having specific gravity of 2.3 at 25^0C.

2. Two particles A and B having diameter 0.4 mm and 0.9 mm respectively are released in water at same time having similar densities. Determine the ratio of settling velocity of particle A to B

3. A settling column analysis is run on suspension type-I which is having a height of 2 m and the initial concentration of well mixed sample of 650 mg/l. Results of the analysis are shown below. Using this table determine (a) theoretical efficiency if the loading rate is 2.4×10^{-2} m/min (b) theoretical efficiency if the loading rate is 3.0×10^{-2} m/min and (c) theoretical efficiency of settling basin with a surface area of 500 m^2 and 14,400 m^3/d

Time (min)	0	58	77	91	114	154	250
Conc'n remaining (mg/l)	650	560	415	325	215	130	52

4. A settling column analysis is run on suspension type-II and the results of the analysis are shown below. Using this table determine (a) theoretical efficiency of a settling basin with a depth of 3.5 m having a volume of 1400 m^3 and inflow rate of 14,400 m^3/d (b)) theoretical efficiency of a settling basin with a depth of 2.5 m having a volume of 2200 m^3 and inflow rate of 13,200 m^3/d

	Time (min)							
Depth (m)	0	40	80	120	160	200	240	280
0.5	820	369	238	164	107	66	41	33
1.0	820	442	369	279	213	164	115	90
1.5	820	631	476	361	287	230	180	148
2.0	820	672	558	426	353	287	238	187
2.5	820	713	590	492	402	344	262	230
3.0	820	722	615	533	460	394	320	262

3.5	820	738	656	574	492	418	360	303

5. A rectangular sedimentation tank is required to treat a flow of 2.5MLD. The size of the tank is 17.5x5.5x3.5m. If 80 ppm suspended solids are present in water and assuming 75% as removal efficiency for particles having specific gravity of 2.0. Determine (a) average flow of water through the tank (b) Detention time (c) overflow rate and (d) deposition of solids in the tank.

6. Design a rectangular sedimentation tank to treat a flow of 5MLD with a detention period of 4 hours and velocity of flow 0.15m/min

7. Design a circular sedimentation tank with a depth of 3.5 m using all other information from problem 6.

8. Determine the annual quantity of alum and quicklime for a water treatment plant having capacity of 50MLD with alkalinity of water being 5 mg/l of $CaCO_3$. The filter alum dosage is 20 mg/l is required. Assume purity of both alum and quicklime as 80% (Ca = 40, C = 12, S = 32, O = 16, Al = 27, H = 1)

9. Design a baffle walled sedimentation tank to treat a flow of 10 MLD. The detention period of tank is one hour and flow velocity is 0.20 m/min. Assume suitable data wherever required.

10. Determine the annual quantity of copperas and quicklime (to be used together) for treating a flow of 5 MLD with a coagulant dosage of 15 mg/l.
(Fe = 56, Ca = 40, S = 32, O = 16, H =1)