Ref No. –Ex/CE/T/423(E)/2019

B.E. CIVIL ENGINEERING 4 TH YEAR 2ND SEM. EXAMINATION, 2019
Fourth (4Th) year, 2nd Semester

SUBJECT: ADVANCED WATER AND WASTEWATER TREATMENT (ELECTIVE)

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

Full Marks ~~30~~/100

Use a separate Answer-Script for each part

No. of Questions	Part I (Marks:60)	Marks
	Answer any Three (3) questions. Two (2) marks are reserved for neatness and to the point answer. Assume relevant data if necessary	
Q1. a)	State and Explain the two film theory regarding gas transfer between liquid-gaseous phases..	(5)
b)	Derive the equation .for gas transfer in following form:- $\text{Log}_e C_S - C_T / C_S - C_O = -0.4343 K_{La} t$	(8)
c)	In an aeration experiment on the removal of CO_2 from water by spray aeration , into the air in droplet of size 2mm diameter, the initial super saturation of the water with the gas was found to be 7.5 mg/l . After 5 secs to exposure the concentration was reduced to be 0.75mg/l. Determine the gas transfer co-efficient (K_{La}).	(7)
Q 2. a)	Draw a neat flow diagram for the treatment of ground water containing all common impurities present in subsurface water . Justify with reason for providing each units.	(7)
b)	What is an 'ideal settling tank'?	(5)
c)	Compute the terminal settling velocity of a spherical particle with diameter 0.5 mm and specific gravity 2.5 settling through water at 22 °C temperatures. Given kinetic viscosity of water = 0.962 centistoke Solve the above problem upto 3rd trial	(8)
Q3. .a)	With the help of a suitable example show that more numbers of fall will more efficient than a single cascade. Deduce the necessary equation also.	(6)
b) c)	A settling column of 2.0 m depth yields the following results. Time, Min: - 0 60 80 100 130 200 240 420 Concn, mg/L :- 300 189 180 156 128 111 78 27 What will be the basin efficiency of the settling tank with a loading rate of 20M ^{3}/M^2/day? Use graphical method for solving the problem	(14)

Ref No. –Ex/CE/T/423(E)/2019

B.E. CIVIL ENGINEERING 4 TH YEAR 2ND SEM. EXAMINATION, 2019
Fourth (4Th) year, 2nd Semester

SUBJECT: ADVANCED WATER AND WASTEWATER TREATMENT (ELECTIVE)

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:60)	Marks
Q4.		
a)	Derive an equation for computing the head loss through filter bed under clean condition with necessary assumption and using conventional symbol of hydraulic and media parameters.	(10)
b)	A clean water is passed through a bed of uniform sand at a filtering velocity of 1.4×10^{-3} m/sec. The sand grains are of 0.4mm in dia and shape factor =0.85,sp .gr =2.65 with bed porosityis 0.40. Find the head loss in the bed in mm. Assume K=5.Take v= 1.01×10^{-2} m2/sec. Compute the head loss at 0^0 C and 20^0 C. v_0= 1.79×10^{-2} m2/sec.	(10)

Ref. No.EX/CE/T/423E/2019

B.E. CIVIL ENGG. 4TH. YEAR 2ND. SEM. EXAM. - 2019

Subject: ADANCED WATER & WASTEWATER TREATMENT **Time: Three Hours** **Full Marks: 100 (40 for Part-II)**

Part: Part-II

Use a Separate Answer-Script for Each Part
Answer any 2 (Two) questions

1. Design a bar rack and screen chamber for fully cleaned as well as 50% clogged conditions with raised floor downstream to the bars. Also sketch a hydraulic profile through the bar rack and screen chamber. The data given is as follows: Average Flow = 45 MLD; Peak Flow = 135 MLD; Diameter of Incoming Sewer = 1.40 m; Depth of Flow in Sewer at Peak Flow = 1.05 m; Velocity in Sewer at Peak Design Flow = 1.16 m/sec; Drop of Screen Chamber Floor with respect to Sewer Invert = 0.10m; Width of Rectangular Bars = 10 mm; Clear Spacing between Bars = 25 mm; Bar Shape Factor $\beta = 2.42$; Inclination of the Bar Screen = 75^{O}. Assume any other suitable data and suitable formula as and when necessary. 20

2. Design grit chamber to remove grit particles based on the following given data. Also design a proportional flow weir (symmetrical sharp-edged; c = 0.61) which acts as a control device at the effluent point. Average Flow = 45 MLD; Peak Flow = 135 MLD; Size and Specific Gravity of the Grit Particles to be removed = 0.15 mm and 2.65; The Minimum Temperature = 15^{O}C and Viscosity $\nu = 1.14 \times 10^{-6}$ m^2/s; Efficiency of Removal $\eta = 75\%$; Measured Settling Basin Performance n = 1/8; K = 0.04 and f = 0.03. Assume any other suitable data and suitable formula as and when necessary. 20

3. Design a secondary sedimentation tank (circular) to treat effluent from an Activated Sludge Process based on the following data: Average Flow = 45MLD and Peak Flow Factor = 2.25; Influent MLSS concentration = 3000 mg/L; Surface Loading Rate = 20 m^3/ day/ m^2; Solid Loading Rate = 80 kg/ day/ m^2 (Average Flow); Solid Loading Rate = 210 kg/ day/ m^2 (Peak Flow); Permissible Weir Loading = 150 m^3/ day/ m; For effluent weir, provide 90^{O} V-notches @ 20 cm c-c with $C_d = 0.60$. 20