Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2013

Subject code: 1721802 **Date: 27-12-2013**

Subject Name: Treatment Process Design and Drawing

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Design a bar screen to treat a wastewater flow of 0.3 m^3/s and draw a neat sketch. **08**

(b) With the help of neat sketches explain any two flow measuring devices **06**

Q.2 **(a)** Explain the purposes of providing equalization tank. Explain inline and offline equalization. What are its benefits? **06**

(b) Design an equalization basin for the following: **08**

Time h	00	01	02	03	04	05	06	07	08	09	10	11
Flow m3/s	0.0481	0.0359	0.0226	0.0187	0.0187	0.0198	0.0226	0.0359	0.0509	0.0631	0.0670	0.0682
Time h	12	13	14	15	16	17	18	19	20	21	22	23
Flow m3/s	0.0718	0.0744	0.0750	0.0781	0.0806	0.0843	0.0854	0.0806	0.0781	0.6670	0.0583	0.0526

OR

(b) With the help of neat sketch explain any two: **08**

(i) Step aeration process
(ii) Contact stabilization process
(iii) Oxidation ditch
(iv) Step feed process.

Q.3 **(a)** Design a clariflocculator for a flow of 8 MLD. **10**

(b) Define the following: **04**

(i) Velocity gradient
(ii) RPM of paddles

OR

Q.3 **(a)** With the help of neat sketches explain any two types of mixers used in water and wastewater treatment. **08**

(b) Give the classification of different types of filtration systems. **06**

Q.4 **(a)** Design a two stage Trickling Filter system for a flow of 10 MLD to produce an effluent of BOD 30 mg/L. **10**

(b) Define the terms :

(i) SOR (ii) WOR (iii) Scour velocity (iv) F/M ratio **04**

OR

Q.4 (a) For ASP with recycle find the volume of aeration tank, sludge wasting rate, Recycle ratio to treat waste water with following characteristics: **10**

Flow: 1000 m^3/d

BOD:350 mg/L

Y: 0.45

Kd: 0.1

Ks : 20

SRT : 8 days

MLSS :2500 mg/L

Check for F/M ratio.

Q.4 (b) Enlist and discuss the design criteria for flocculator and clarifier. **04**

Q.5 Design cyclone with following particle size distribution **14**

Particle size in µm	50	40	30	20	10	5	2
Particle by wt. less than	90	75	65	55	30	10	4

Assume the following

Density of particle = 2500 kg/m^3

Gas is essentially nitrogen at 150^oc

Volumetric flow rate = 4000 m^3/hr

90% recovery of particle required

Viscosity of nitrogen at 150^oc = 0.023mµs/m^2

Fc = 0.005

$\Phi = 0.9$

Also, workout pressure drop

OR

Q.5 With the help of a neat sketch, explain the construction and working of **14**

(i) Cyclone separator

(ii) Venturi scrubber

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