

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 $0.3 \text{ m}^3/\text{s}$ 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 m^3/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 m^3/s	0.0718	0.0744	0.0750	0.0781	0.0806	0.0843	0.0854	0.0806	0.0781	0.06670	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 m³/d
 BOD:350 mg/L
 Y: 0.45
 K_d: 0.1
 K_s : 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/m³

Gas is essentially nitrogen at 150°C

Volumetric flow rate = 4000 m³/hr

90% recovery of particle required

Viscosity of nitrogen at 150°C = 0.023 mPa·s

F_c = 0.005

Φ = 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
