

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- VIII<sup>th</sup> SEMESTER-EXAMINATION – MAY- 2012****Subject code: 181303****Date: 14/05/2012****Subject Name: Treatment Process Design & 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** Design a complete mixed ASP to serve 60,000 people that will give final effluent that has 5 day BOD not exceeding 25 mg/L. The following data is available: **14**

Sewage Flow=150 L/capita –day.

BOD<sub>5</sub>=252 mg/L

Y=0.6

K<sub>d</sub> =0.07 d<sup>-1</sup>

MLSS=4000mg/L

MCRT = 5 days

**Q.2 (a)** Design a tube settler module of circular cross section( with 50 mm diameter). Assume following conditions. **07**

(i) Average output required from settler =8MLD

(ii) Length of tube=1m

(iii) Angle of inclination=60°

**(b)** A column test was run to determine the settling characteristics of an activated sludge suspension. The results of the analysis are shown below: **07**

MLSS (mg/L)	1400	2200	3000	3700	4500	5200	6500	8200
V (m/hr)	3.00	1.85	1.21	0.76	0.45	0.28	0.13	0.089

The influent solids concentration is 3000 mg/L and the flow rate is 8000 m<sup>3</sup>/day. Determine the size of clarifier that will thicken the solids to 10,000 mg/L

**OR**

**(b)** Explain the terms: Hydraulic Loading Rate, Surface Overflow Rate, Weir Loading Rate, Scour velocity, Sludge Volume Index, Solid Flux, Volumetric Loading Rate **07**

**Q.3** Design a clariflocculator to treat a flow of 100 MLD. **14**

**OR**

**Q.3** Design an Upflow Anaerobic Sludge Blanket Reactor for an average flow of 5MLD of wastewater with following data. **14**

(i) COD of wastewater =400mg/l

(ii) Designed HRT = 6 Hrs

(iii) Designed COD loading = 1-2 Kg COD /m<sup>3</sup>/day

(iv) Upflow velocity through sludge bed=0.75 m/hr

(v) Velocity of wastewater in settling chamber &lt;1.5 m/hr

(vi) Flow area covered by inlet (each) =1 to 2 m<sup>2</sup>

**Q.4 (a)** Design an equalization basin for the following:

**07**

Time h	00	01	02	03	04	05	06	07	08	09	10	11
Flow m <sup>3</sup> /s	0.048	0.036	0.023	0.019	0.019	0.020	0.023	0.036	0.051	0.063	0.067	0.068

Time h	12	13	14	15	16	17	18	19	20	21	22	23
Flow m <sup>3</sup> /s	0.072	0.074	0.075	0.078	0.081	0.084	0.085	0.081	0.078	0.667	0.058	0.0526

**(b)** Enlist and explain the different types of Aeration systems used for wastewater treatment. **07**

**OR**

**Q.4** Design and draw a bag filter for the flow of 5m<sup>3</sup>/s. **14**

**Q.5** Design a screen (Bar Rack ) with approach channel for flow 50 MLD. Assume following conditions in incoming trunk sewer: **14**

- (i) Diameter of sewer=1.6m
- (ii) Depth of flow at peak flow =1.0m
- (iii) Velocity at peak designed flow=0.8m/s
- (iii) Drop of screen chamber flow with respect to sewer invert=0.07m

**OR**

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

Particle size in $\mu\text{m}$	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<sup>3</sup>  
Gas is essentially nitrogen at 150°C

Volumetric flow rate = 4000 m<sup>3</sup>/hr

90% recovery of particle required

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

$F_c = 0.005$

$\Phi = 0.9$

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