Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII EXAMINATION – WINTER 2015

Subject Code:181303 **Date:07/12/2015**

Subject Name: Treatment Process Design and Drawing

Time: 2:30pm to 5:00pm **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 clariflocculator for a flow of 10 MLD. Prepare a dimensioned sketch of the designed unit. **14**

Q.2 (a) Design a bar rack for a peak flow 75 MLD. Flow conditions in incoming tank sewer is given by: **07**

(a) Diameter of sewer =1.6 m
(b) Depth of flow at peak flow=1.0m
(c) Velocity at peak designed flow=0.75m/s

Drop of screen chamber flow with respect to sewer invert is =0.06m

(b) A cloth filter has R_f and R_p resistance values of 30, 000 kg/m^2.sec and 50, 000 Sec^{-1} respectively. The filter area is 1200 m^2 and volume flow rate of air 10 m^3/sec with a dust loading of 6 g/m^3. Determine: **07**

(a) The pressure drop at start up in pascal and milibar
(b) The mass area concentration W after 6 hr of operation in kg/m^2.
(c) The pressure drop after 5 hr in N/m^2 & milibar.

OR

(b) Determine the dimensions of UASB reactor for flow rate of 150 m^3/day. & COD = 6000 mg/L. **07**

Q.3 (a) Write down the purpose & location of following unit in wastewater treatment plant. **07**

(a) Ammonia Stripping
(b) Equalization Tank
(c) Filter
(d) Coagulation & Flocculation Tank
(e) Grit Chamber
(f) Lagoons
(g) Sludge concentration and Dewatering System
(h) Sludge digestion System
(i) Sludge thickening Unit

(b) Discuss the selection criteria for flow measuring devices. **07**

OR

Q.3 (a) Find the dimensions of rapid sand filter for the town of 50, 000 populations. The rate of water supply is 250 L/day. Take peaking factor = 1.5. Assume all necessary data. **07**

(b) Design a tube settler module of Square cross-section with design inflow of 200 m^3/h. Assume suitable data for design. **07**

Q.4 (a) For ASP with recycle find the volume of aeration tank, sludge wasting rate, Recycle ratio and oxygen requirement to treat waste water with following characteristics: **14**

Flow: 5000 m^3/d
BOD:3350 mg/L
Y: 0.45
Kd: 0.1
Ks : 20
SRT : 8 days
MLSS :2500 mg/L
Check for F/M ratio.

OR

Q.4 (a) A secondary clarifier processes a total flow of 10,000 m^3/day from a conventional activated sludge reactor. The concentration of solids in the flow from the reactor is 2600 mg/L. The results of a settling analysis on the sludge is given below: **07**

Concentration, mg/L	1400	2600	3940	5425	6930	9100	12000
Settling Velocity, m/h	5.50	3.23	1.95	1.01	0.55	0.26	0.14

For equilibrium conditions and a solid flux rate of 6 kg/m^2.h, determine the underflow rate, the under flow rate solids concentration, and the over flow rate.

Q.4 (b) Enlist and explain the advantages and disadvantages of venturi scrubber. **07**

Determine the dimensions of the venturi scrubber for a flow of 2 m^3/sec.

Q.5 (a) Define the following terms: **07**

(j) Cane Velocity (ii) Velocity Gradient (iii) Air to cloth ratio (iv) saltation velocity (v) Cut size diameter (vi) Surface and weir overflow rate (vii) pressure drop

(b) Design a Bag filter for a flow of 10 m^3/sec. **07**

OR

Q.5 (a) Design a Cyclone separator for a flow of 5000m^3/hr. The gas is air at 100^0C, density of particle is 2500kg/m^3, Viscosity of air 100^0C is 1.84 x 10^{-5} kg/m.s. **14**

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