Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1721802 **Date: 09/07/2012**

Subject Name: Treatment Process Design & Drawing

Time: 10:30 am – 13:00 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 RSF system for a town of 1 lakh population. The rate of water supply is 200L/ca-day. Take a peaking factor of 1.5. Assume all the suitable data. **14**

Q.2 **(a)** Write a short note on Parshall Flume showing plan and section. **06**

(b) A horizontal parallel-plate electrostatic precipitator consists of a single duct 7 m high and 6 m deep with a 280 mm plate-to plate spacing. Given collection efficiency at a gas flow rate of 119 m^3/min, you are required to determine the bulk velocity of the gas, outlet loading, and drift velocity of this electrostatic precipitator. Also calculate a revised collection efficiency if the flow rate and the plate spacing are changed. **08**

Given conditions :
Inlet loading = 6.4 g/m^3
Collection efficiency at 119 m^3/min = 88.2%
New increased flow rate = 153 m^3/min
New plate spacing = 230 mm

OR

(b) Define the following terms including the importance of each in the design and operation of the treatment unit: **08**
(i) Detention time (ii) RPM of paddles (iii) Weir overflow rate
(iv) Surface Overflow Rate.

Q.3 Design a coarse screen for average flow of 30 MLD. Assume suitable data **14**

OR

Q.3 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: 2000 m^3/d
BOD:500 mg/L
Y: 0.45
Kd: 0.1
Ks : 20
SRT : 8 days
MLSS :2500 mg/L
Check for F/M ratio.

Q.4 Design a clariflocculator to treat a flow of 50 MLD. **14**

OR

Q.4 Design a two stage Trickling Filter with equal volume (based on NRC Equation) from the following data: **14**
Q=10 MLD
Packing Factor=2.25
Influent BOD=180 mg/L

Effluent BOD=10 mg/L
Recycle ratio =1.5

Q.5 **(a)** Design a tube settler module of square cross section with design inflow of 250 m^3/hr. Assume following data: **07**
Diameter of tube=50 mm
Length of tube=1 m
Angle of inclination=45^0

(b) For a Rapid Sand Filer the characteristics and sieve analysis is shown below. Determine the head loss for clean filter in a stratified condition: **07**
Depth=0.6m
Filter loading=120 m^3/ m^2 d
Specific gravity of sand=2.5shape factor=1.00
Stratified bed porosity=0.42
Kinematic Viscosity=1.029 x10^{-6} m^2/s

Geometric mean size, mm	2.00	1.42	1.00	0.714	0.505	0.357	0.252	0.178
Mass percent retained	0.01	0.39	5.7	25.9	44	20.20	3.7	0.1

OR

Q.5 Find the dimensions of an Upflow Anaerobic Sludge Blanket Reactor for an average flow of 4MLD of wastewater with following data. **14**

(i) COD of wastewater =500mg/l
(ii) Designed HRT = 6 Hrs
(iii) Designed COD loading = 1-2 Kg COD /m3/day
(iv) Upflow velocity through sludge bed=0.75 m/hr
(v) Velocity of wastewater in settling chamber<1.5 m/hr
(vi) Flow area covered by inlet (each) =1 to 2 m^2

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