GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1721802   **Date: 18-06-2014**
Subject Name: Treatment Process Design and Drawing
Time: 02:30 pm - 05:00 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)** Air at 350 ^{0}F with a dust loading of 0.352 kg/m^3 passes through a fabric filter. **07**
After a period of 7 hrs, the total pressure drop across the filter is increased as
900 N/m^2 of water column. The filter cake density is 1.1 g/cm^3 and the
residual pressure drop across the cleaned filter is 112.5 N/m^2 of water column.
If air velocity is maintained at 0.02032 m/sec during test. Estimate the dust
permeability, Kp in m^2.

(b) Enlist and Explain the design variables of the Bag filter. **07**

Q.2 **(a)** A horizontal parallel plate ESP consists of a single duct with 6 m high and 5 **07**
m deep with a 280 mm plate to plate spacing. Given a collection efficiency at
a gas flow rate 119 m3/min. you are required to determine the bulk velocity of
gas, outlet loading and drift velocity of this ESP. You are also requested to
calculate a revised collection efficiency if the flow rate and plate spacing are
changed.

(b) Enlist the particulate control Equipments with their collection mechanisms **07**
and approximate efficiency.

OR

(b) Explain the following terms with reference to air pollution control **07**
equipments:
(i) Air to Cloth Ratio (ii) Pressure Drop (iii) Relaxation time (iv) Saltation
velocity (V) Velocity Ratio (vi) Number of turns (vii) collection efficiency

Q.3 **(a)** Design a cyclone separator for maximum particle collection efficiency for **14**
90,000 m^3/hr gas stream at a 100 ^{0}C. Consider the gas o be air releasing 600
g/sec of dust. Dust mean diameter is 12 µm. Density of particle is 1500 kg/m^3.
Estimate pressure drop & overall collection efficiency of the design unit. Use
the size fraction of the dust sample given in the following:

Average Dia. (µm)	Mass fraction
10	025
19	0.20
11.5	0.15
7.8	0.10
5.5	0.05

OR
Q.3 **(a)** Design a clariflocculator for 20 MLD design flow rate. Assume suitable data. **14**

Q.4 **(a)** Design a bar rack for a peak flow of 85 MLD and velocity at pick design flow   **14** is 0.8 m/sec. Assume suitable data.

<div align="center">OR</div>

Q.4 **(a)** Explain following aerators: **14**
(i) Aspirating Aerator
(ii) Down flow Bubble Contactors
(iii) Jet Aerators

Q.5 **(a)** Enlist and explain the following terms in detail: **14**
(i) Biomass Growth rate (ii) Growth yield (iii) Substrate Utilization in microbial culture (iv) Endogenous respiration (v) Food to Microbes ratio (vi) Sludge age.

<div align="center">OR</div>

(a) Design a UASB reactor to treat average flow of 60 MLD municipal sewage in   **14** a single reactor. The wastewater has following characteristics
COD = 740 mg/L BOD 370 mf/L TSS 810 mg/L and VSS = 485 mg/L

<div align="center">*************</div>