

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1721802

Date: 03-12-2014

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) With the help of a neat sketch, explain the construction and working of Cyclone separator **07**
(b) Design a bar screen to treat a wastewater flow of 0.2 m³/s and draw its neat Sketch. **07**

- Q.2** (a) Enlist the different types of flow measuring devices and explain any one with a neat sketch. **07**
(b) With the help of neat sketches explain any two types of mixers used in water and wastewater treatment **07**

OR

- (b) Define the terms: **07**
1. SOR 2. Detention time 3. WOR 4. Scour velocity
5. Mean Cell Residence time. 6. F/M ratio 7. Effective size of sand.

- Q.3** (a) Design a Cyclone Separator for maximum particulate collection efficiency for 23,400 m³/h gas stream at 100 °C. Consider the gas to be air releasing 150g/s of dust. The dust mean diameter is 12 µm and $\rho_p = 1500 \text{ kg/m}^3$ **14**
(a) Determine dimensions of components of cyclone.
(b) Determine pressure drop through cyclone.
Take $\mu_g = 2.1 \times 10^{-5} \text{ kg/m-s}$.

OR

- Q.3** (a) Air at 77°C passes through fabric filter for a period of 5h 24 minutes, after which the total pressure drop is measured as 1.18 kPa. The filter cake density is 1280 kg/m³, and the residual pressure drop across the cleaned filter before the test is 137 Pa. The air velocity is 1.28 m/min, during the test and the initial dust loading is 32 g/m³. Estimate the permeability K_p of the dust layer in units of square meter. **14**

- Q.4** (a) Design a clariflocculator for a flow of 10 MLD. **14**

OR

- Q.4** (a) Enlist the various modifications of Activated Sludge Process and explain any two. **07**
(b) Differentiate between Rapid Sand Filter and Slow sand Filter giving at least seven points of difference. **07**

- Q.5** (a) Design a ASP process for a flow of 500 m³/d with inlet BOD of 300 mg/L. Assume following data: **14**
 $Y=0.5$ $MLSS=2500\text{mg/L}$ $K_d=0.15$
 $K_s=20$ $MCRT=8 \text{ days}$

OR

- Q.5** (a) (1) Highlight the benefits of equalization. **08**
(2) Enlist the types of aeration system and explain any one type with sketch.
(b) Give the classification of filtration systems. **06**