INDIAN INSTITUTE OF TECHNOLOGY
Department of Chemical Engineering
Subject Name: **Industrial Pollution Control**
Subject No.: **CH 62007**
End Autumn Semester Examination, 2010

Time: 3 **Hrs** Full Marks: **50**
No. of Students:84
Instructions: Answer **all** questions. (Make reasonable assumptions wherever applicable)

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1. a).Discuss and explain discreet and flocculent settling in a sedimentation tank.[2]

   b) List the important steps for Hazardous waste management. [2]

   c)Draw an outline diagram of a spray tower. What are the advantages of wet collector over the dry ones? [2]

   d)Describe why sludge quality consideration is essential for good performance of the activated sludge process. What kind of sludge commonly generates in a plug flow system using complex organic wastewater. [2]

   e)Draw and label of a typical Baghouse as used in Air pollution control [2]

   f)Describe briefly anaerobic decomposition for treating industrial wastewater. How this is different from the aerobic process. [2]

   g) List the design parameters to be considered for a Neutralization system in wastewater processing. [2]

   h)List the typical constituents one can expect in a Pulp and Paper mill waste water also suggest the treatment processes for their treatment and removal. [2]

   i)Name an industrial effluent that often requires combine Anaerobic-Aerobic treatment. What are the extra benefit for such system ? [2]

   j) What is facultative lagoon? Describe with a diagram [2]

2. a) Describe and compare an attached growth and suspended growth systems of biological treatment of wastewater. Outline with a sequence of operations for sludge treatment for ultimate disposal [5]

b) Calculate the hydraulic retention time and the sludge age of the following. The influent and the effluent BOD are 700mg/l and 40 mg/l respectively. The volatile suspended solid concentration is 3000 mg/l. The yield coefficient and endogenous coefficient are 0.4 and 0.1 respectively. K is 10 day^{-1}

[5]

3. a) Describe with an outline diagram the three stages of Methane formation in an anaerobic process. Also describe the factors affecting the process operation. [4]

   b) Describe with examples how adsorption process can be utilized in combating air pollution. Draw an outline diagram of a fixed bed adsorber.

   [3]

   c) Describe with diagram the particle capture mechanisms as the dust laden gas passes through the packed filters. [3]

4. a)Describe with a diagram the operating principle of a reverse flow Cyclone separator as a air pollution control device [3]

   b) A reverse flow cyclone handles 3.5 cu.m/sec of dust laden air with a density of 1800 kg/m^3. Considering the effective number of turns a gas makes in traversing the cyclone as 6 and the diameter of the cyclone as 1.2 m, determine the collection efficiency of the cyclone using the correlation given as follows. (d_{pc} is the cut size i.e size of particles collected with 50 % efficiency) μ_g : 1.8×10^{-5} kg/m.s. The entrance height and the width of the cyclone are 0.5m and 0.25m respectively.

d_p / d_{pc} (particle size ratio)	collection efficiency
0.4	15%
0.5	22%
0.6	30%
0.7	37%
0.8	41%
1.0	50%

[5]

   c) Describe the reason why steam injection around a flare tip is beneficial for waste gas treatment. [2]