GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019

Subject Code: 2173515   **Date: 03/12/2019**

Subject Name: Design Of Air Pollution Control System And Air Quality Modeling

Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

			MARKS
Q.1	**(a)**	Explain various natural mechanisms for removal of gaseous component and particulate matter.	**03**
	(b)	Enlist different methods for prevention of air pollution problem.	**04**
	(c)	An aerosol consisting of particles 0.63 and 0.83 mm in diameter in equal mass amounts passes through a gravity settler at a flow rate of 3.60 L/min. Given the following data, use Stokes' law with the Cunningham correction factor to calculate the efficiency of the settler. Length = 50 cm, Width = 20 cm, Height of channel = 0.124 cm, Number of channels = 19 ρ= 1.05 g/cm3 η = 0.1 µ m μ= 0.0182 cp.	**07**
Q.2	**(a)**	Write a note on Seaboard process, Girbotol process, Claus process for sulphur removal during combustion.	**03**
	(b)	Write a note on Particle charging, Particle Collection and Removal of collected dust in Electrostatic Precipitator.	**04**
	(c)	A cyclone on a cement plant suddenly malfunctions. By the time the plant shuts down, some dust has accumulated on parked cars and other buildings in the plant complex. The nearest affected area is 700 ft from the cyclone location, and the furthest affected area measurable on plant grounds is 2500 ft from the cyclone. What is the particle size range of the dust that has landed on plant grounds? On this day, the cyclone was discharging into a 6.0 mph wind. The specific gravity of the cement is 1.96. The cyclone is located 175 ft above the ground. Neglect effects of turbulence. A diagram representing the system is provided. (S=smaller particle, L= larger particle). For air at ambient conditions, one obtains ρ= 0:0741 lb/ ft3 μ= 1:23* 10^5 ft / s Wind speed =o.6*5280= 31,700 ft/hr	**07**

OR

	(c)	Explain lime scrubbing process and magnesium oxide scrubbing process for Sulphur removal from flue gases.	**07**

Q.3 **(a)** Enlist most important methods on Sulphur reduction within combustion chamber. **03**

     (b) Enlist methods of desulphurization of flue gases. **04**

     (c) A sodium hydroxide spray in air at 308C is to be collected in a gravity settler. The unit is 30 ft wide, 15 ft high, and 40 ft long. The volumetric flow rate of the gas is 42 ft3/s. Calculate the smallest mist droplet (spherical in shape) that will be entirely collected by the settler. The specific gravity of the mist droplets may be assumed to be equal to 1.21. **07**

OR

Q.3 **(a)** Write a note on Lapple theory. **03**

     (b) Write a note on Leith and Licht theory. **04**

     (c) Write all design equations of Electrostatic Precipitator and explain their significance. **07**

Q.4 **(a)** Enlist different methods for prevention of air pollution problem. **03**

     (b) Draw a chart for classification of gravity settler. **04**

     (c) Write a note on Simple Expansion Chamber. **07**

OR

Q.4 **(a)** How many type of air cyclones are there? Explain briefly each type. **03**

     (b) Explain Desulphurization of flue gas by metal oxide. **04**

     (c) Write a note on activated carbon process for desulphurization of flue gas. **07**

Q.5 **(a)** Write a note on Particle charging, Particle Collection and Removal of collected dust in Electrostatic Precipitator. **03**

     (b) If the temperature in Problem S1 is 258C, what is the smallest droplet that can be controlled if the gas is at 2008C? Assume that at 2008C,m ¼ 2.0 _ 1024 g/cm . s. **04**

     (c) Write a note on Multiple Trays settling Chamber. **07**

OR

Q.5 **(a)** Derive performance equation (Design Equation) for gravity settling chamber. **03**

     (b) Write all design equations of cyclone separator and explain their significance. **04**

     (c) Enlist most important methods on Sulphur reduction within combustion chamber. **07**

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