Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2173515 **Date: 29/11/2018**

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)**	Write a note on hydrodesulphurization of coal.	**03**
	(b)	Explain Hybrid (Lagrangian/Eulerian) Models.	**04**
	(c)	A furnace is burning at 12 tons of 2.5% Sulphur coal/hr with an emission rate of 151 g/s. The following exist: H=120m, u=2m/s, Y=0. It is one hour before sunrise, and the sky is clear. Find the downwind ground level SO_2 concentration at X=500 m, Y=0 and Z=0.(use table 3.3)	**07**
Q.2	**(a)**	Draw a neat figure of cyclone separator and explain it's working.	**03**
	(b)	Derive an equation of stocks law for gravity settler.	**04**
	(c)	Explain all methods of NOx removal.	**07**
		OR	
	(c)	Write a short note on air models.	**07**
Q.3	**(a)**	Explain working and principle of Electrostatic Precipitator.	**03**
	(b)	Explain working of gravity settler with appropriate figure.	**04**
	(c)	The traffic density for a highway is 1200 vehical/hr and average vehicle speed is 80 km/hr. The average vehicle speed is 80 km/hr. The average carbon monoxide emission is 40g/s. Estimate the carbon monoxide concentration 250 m and 500 m downwind on highway if wind speed normal to highway will be 2 m/s.(use table 3.3)	**07**
		OR	
Q.3	**(a)**	Explain cleaning mechanism in bag filter.	**03**
	(b)	Explain the Gaussian model's assumptions and limitations.	**04**
	(c)	Explain natural removal methods for sulphur from atmosphere.	**07**
Q.4	**(a)**	Explain methods of SOx removal from crude oil extraction.	**03**
	(b)	Write a note on Alkalized Alumina process.	**04**
	(c)	Write a short note on Sea board, Girbotal process and Clause process.	**07**
		OR	
Q.4	**(a)**	Following abbreviations stands for: VOC,PPM, POP	**03**
	(b)	Explain Chemico process with proper flow sheet.	**04**
	(c)	A plant has a 60,000acfm gas stream containing a hazardous dust with an estimated drift velocity of 0.250ft/s. The minimum required efficiency is 99.80%. Assume that the Deutsch–Anderson (DA) equation applies. LT Associates has proposed (as a control device) a tubular-type precipitator with tubes 10 inch in diameter and 10ft height. How many tubes are needed? Approximate the volume occupied by the tubes.	**07**

Q.5 **(a)** What is avalanche mechanism? **03**

(b) Write a note on photochemical model. **04**

(c) Explain all steps of graphical method of cyclone seperator. **07**

OR

Q.5 **(a)** Explain ventury scrubber. **03**

(b) Write a note on catalytic processes for sulphur removal. **04**

(c) Estimate the cut diameter and overall collection efficiency of a cyclone given the particle size distribution of dust from cement kiln. Particle size distribution and other pertinent data are given below. **07**

Gas viscosity = 0.02 Cp;
Specific Gravity of the particle = 3.0;
Inlet gas velocity of cyclone = 48 ft/sec;
Effective number of turns within cyclone = 5 ;
Cyclone diameter = 8 ft ;Cyclone inlet width = 2 ft.

ρ_p= 187.2 lb/ft

Average Partical Size, dp (µm)	1	5	10	15	20	25	30	35	>40
Wt Percentage	9	15	15	25	10	10	6	3	7

Standard efficiency curve for a cyclone separator

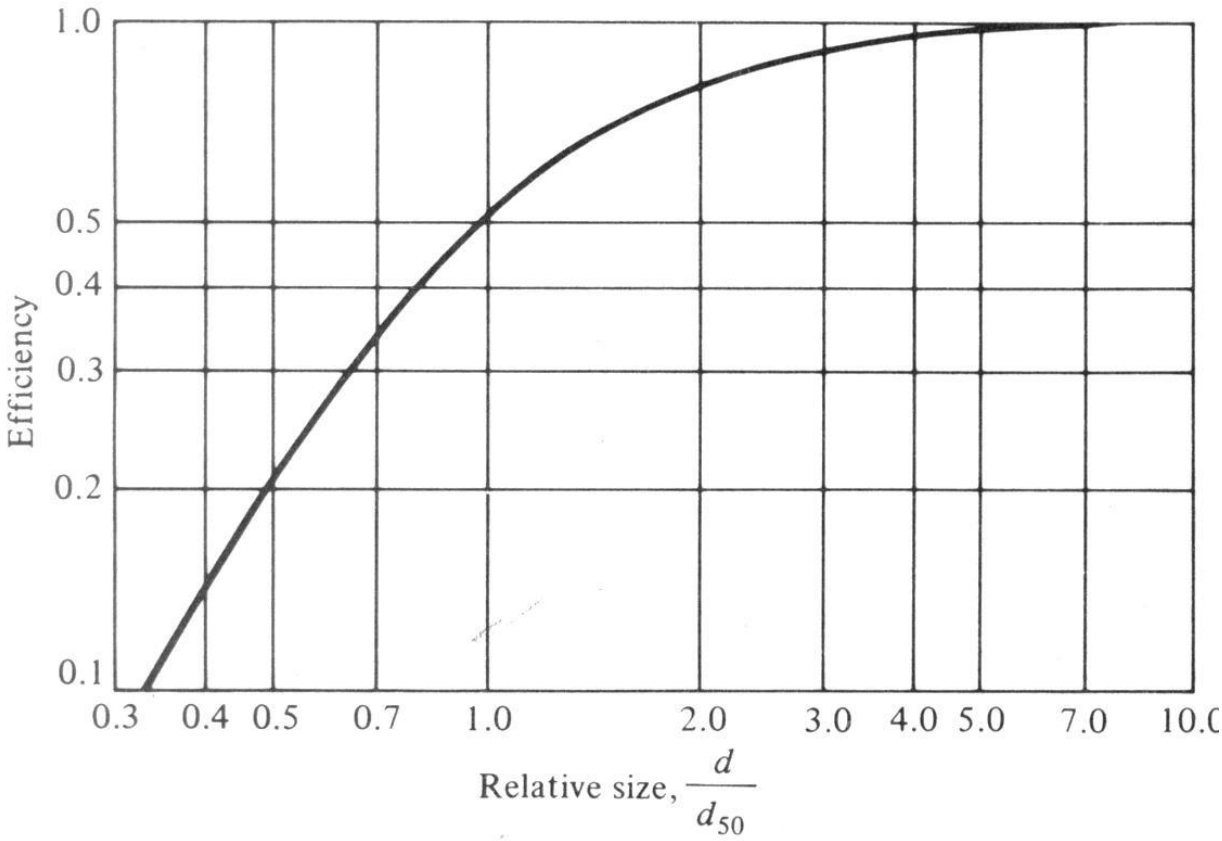

Table-3.3

conditions during day or

Table 3.3 Fitted values for σ_y and σ_z

Class	A	x_1 (metres)	$x \leqslant x_1$		x_2 (metres)	$x_1 \leqslant x \leqslant x_2$	
			B	p		B	p
A	0.40	250	0.125	1.03	500	0.00883	1.51
B	0.295	1000	0.119	0.986	10000	0.0579	1.09
C	0.20	1000	0.111	0.911	10000	0.111	0.911
D	0.13	1000	0.105	0.827	10000	0.392	0.636
E	0.098	1000	0.100	0.778	10000	0.373	0.587

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