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MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL UNIVERSITY



SIXTH SEMESTER B. TECH. CHEMICAL ENGINEERING MAKE UP EXAMINATION MAY 2017

SUBJECT: O.E.: INDUSTRIAL POLLUTION CONTROL (CHE 3282)

Time: 3 HOURS

Max.Marks: 100

Note: Answer ANY FIVE FULL questions

Each question carries 20 Marks

Gaussian model for plume dispersion:

$$\chi = \frac{Q}{2 \pi \sigma_y \sigma_z u} e^{\frac{-1}{2} \left(\frac{y}{\sigma_y}\right)^2} \left\{ e^{\frac{-1}{2} \left(\frac{z-H}{\sigma_z}\right)^2} + e^{\frac{-1}{2} \left(\frac{z+H}{\sigma_z}\right)^2} \right\}$$

Where:

 χ = ground level pollutant concentration (g/m³)

1 A	Draw a neat self-explanatory diagram of the Nitrogen cycle.	10
1 B	Explain the causes and consequences of imbalance in the hydrologic cycle with a neat diagram	10

2 A	Write short notes on analysis of	2*4=8
	i) Total Solids ii) Alkalinity iii) Biochemical oxygen demand iv) SO ₂ with	
	UV fluorescence	
2 B	Write notes on stack gas sampling system with a neat diagram	4
2 C	Explain any 2 methods each for collecting samples of particulate and	8
	gaseous pollutants	

3 A	Explain the principle and working of one method under each treatment	20
	step. Also write the advantages and disadvantages of each method.	

4 A	Describe the three approaches for capture of CO_2 involved in Carbon sequestration.	6
4 B	 Describe how i) NOx pollution is controlled by low excess air supply during combustion. ii) NOx pollution is controlled by selective catalytic reduction. iii) Particulate emission is controlled using bag filter. iv) Particulate emission is controlled using cyclone separator. 	1*4=4
4 C	A steel plant located 4 km outside the western edge of a city has a smelter with a stack 150 m high. Plume rise is 100 m. Mass flow rate of flue gas emitted from stack is 3770 Kg/s. Wind is blowing eastward at a speed of 3 m/s. It is a sunny day (strong solar radiation). Assume that the pollutant concentration at the plume centerline is blown into the city whose dimensions are 4 km northwards and 3 km eastwards. Given, emission density in the city is $5*10^{-4}$ g/s.m ² and the mixing height of the city is 450 m. Considering the entire city to be enclosed in a box and that fixed box model is applicable, what is the concentration of pollutant in the city?	10

5 A	How is e-waste managed by the following methods?	10
	i) Production process modification	
	ii) Segregation and volume reduction	
5 B	Explain the different processes for sludge treatment (in not more than two or	10
	three sentences per process).	
