Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY

SIXTH SEMESTER B. TECH. CHEMICAL ENGINEERING
END SEMESTER 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/m^3)

1 A	Draw a neat self-explanatory diagram of the carbon 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 i) Odour ii) Acidity iii) chemical oxygen demand iv) SO_2 with UV fluorescence	**2*4=8**
2 B	What is isokinetic condition of sampling particulate matter from a stack? What is its significance?	**4**
2 C	Explain any 2 methods each for collecting particulate and gaseous pollutants	**8**

3 A	What is the purpose of i) Primary ii) Secondary iii) Tertiary treatment of wastewater? Explain the principle and working of one method under each treatment step.	**8+12=20**

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 NOx burner ii) NOx pollution is controlled by selective catalytic reduction iii) Particulate emission is controlled using gravitational settling chamber 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? i) Production process modification ii) Segregation and volume reduction	**10**
5 B	Explain the different processes for sludge treatment (in not more than two or three sentences per process).	**10**

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