MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

M.TECH. (CHEMICAL ENGINEERING)
END SEM EXAMINATIONS, APRIL 2018
SUBJECT: AIR POLLUTION MONITORING AND CONTROL [CHE 5231]
REVISED CREDIT SYSTEM
DATE: 23/4/2018

Time: 3 Hours   MAX MARKS: 50

Instructions to Candidates:

❖ Answer all **FIVE** questions **FULLY**.

❖ Missing data may be suitable assumed.

1A	(i)Explain the different background information needed while designing an air pollution monitoring network?	**2**
	(ii) Explain the terms: a)Dust b) fumes c) mist d) summer smog	**2**
	(iii) If the whole atmosphere would suddenly liquefy due to a drastic event, what would the height of the atmosphere be? (in feet above the sea level)	**1**
1B	(i) What are the reasons for high air pollution in India, explain?	**2.5**
	(ii) Describe the history of air pollution in the World	**2.5**

2A	With a neat sketch explain any five types of plume behavior in a stack based on atmospheric conditions.	**5**
2B	A city is located near an airport. The smelter stack is 400 m high and has a plume rise of 100m. It is emitting 5000 g/s of SO_2. Assume stability class is C (Refer chart in next page) and that wind speed is 3 m/s.	
	A flight path for airport is perpendicular to the plume and 5km downwind of the smelter. The airport safety office has determined that it is unsafe for planes if the planes if the plume concentration > 80 µg/m3. They have also decided that it is unsafe to fly under the plume. What is the minimum altitude the plane can fly safely above the plume? Assume Gaussian plume and neglect ground reflection of plume. Refer chart in next page.	
	(i)Assuming no ground-level reflection	**2.5**
	(ii) Assuming ground-level reflection	**2.5**

3A	List any and write (in a table), five major air pollutants, their corresponding National ambient air quality (NAAQ) limits in residential areas, and their sources	**5**
3B	With a neat diagram explain working of Wet-Dry limestone scrubber for removal of SO_2	**5**

4A	With a help of neat charts of temperature, explain the dependence of NOx formation. Explain thermal NOx, fuel NOx and prompt NOx.	5
4B	With a help of a neat diagram and equations, explain the selective catalytic reduction (SCR) of NOx.	5

5A	i) With a neat diagram derive the expression for fixed box model of air pollution and list the assumptions.	2.5
	ii) What are the control strategies to reduce VOC pollution?	2.5
5B	i) Why is CO called a silent killer?	1
	ii) With a figure of excess air vs carbon monoxide production explain the strategies to reduce carbon monoxide?	3
	iii) List the methods to reduce carbon dioxide (CO_2) emissions?	1
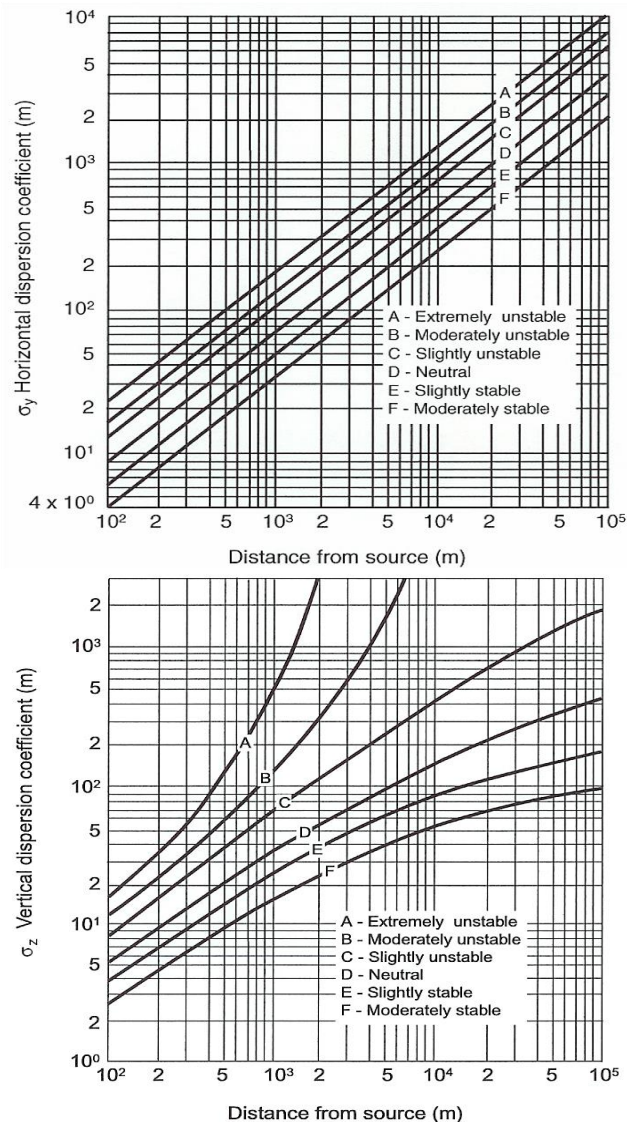
Dispersion coefficients for various stability criteria