

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI CAMPUS
DEPARTMENT OF CHEMICAL ENGINEERING
I Semester – 2023 - 2024

Course Title: Environmental Management Systems (CHE G513)
Mid semester – Closed Book – 30 Marks + Open Book – 30 Marks
Date- 14.10.2023 **Time: 11:00 - 12:30 PM**

Instructions for Exam :

1. Closed book - is comprised of three questions of total 30 Marks and Open Book is comprised of 30 Marks
 2. On returning CB Answer Script – Open book is to be answered in separate Answer Script.
 3. Make necessary assumptions where ever needed.
- 1. (2+2+2+2+2 = 10 Marks) (Be precise in answering)**
- a. A regulatory approach does not necessarily produce the best environmental results. What is the role played by EMS in this regard ?
 - b. The two main pollution control statutes in India are:
 - c. Which are the four pollution abatement agencies responsible for the monitoring of air pollutants in India ?
 - d. To develop a list of emission control alternatives, it is important to understand that options are not limited to add-on emission control devices. Any technique that reduces the emissions is a valid consideration. **Elaborate the options suggested by BACT standards .**
 - e. Which permits are applicable for the Attainment and Non – Attainment areas ?
- 2. (2 + 2 = 4 Marks)**
- One of the objectives of MACT review process was to identify efficiencies that could be implemented to reduce the rulemaking time while **drafting MACT Standards for the surface coatings industry**. The MACT that worked well was promulgated in about 4 years. The project leader told us the industry consisted of less than 30 plants and about half were the major sources of air HAP emissions.
- a) **Why MACT formulation for the coating industries took 4 years of promulgation ?**
 - b) **What was the role played by the early industry involvement during the MACT process ?**
- 3. (2 + 2 + 2 = 6 Marks)**
- The Central Pollution Control Board (CPCB) is an apex body in the field of water quality management in India. For rational planning of any water quality management programme, CPCB needs to know the nature and extent of water quality degradation. Therefore, a sound scientific water quality monitoring programme is prerequisite. Realising this fact, water quality monitoring was started in 1976 by CPCB with 18 stations on the Yamuna river. The programme was gradually extended. Today, there are 1032 monitoring stations in the country spread over all important water bodies. **Based on this :**
- a) **What is meant by water quality monitoring ?**
 - b) **How is TMDL defined ?**
 - c) **What could be the units of TMDL as per US EPA 40 CFR regulations ?**

4. (2 + 3 + 5 = 10 Marks)

A multidimensional approach of regulatory, technical, innovative solutions and integrated control strategies have been taken by the government for improving the overall air quality in the country as per the **NAAQS**.

- a) What are the objectives of the NAMP Program ?
- b) CPCB co-ordinates with various agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support for operating the monitoring stations. **Explain the concept of 24 hours sampling and target frequency of monitoring twice a week, 104 days in a year for the purpose of pollutant sampling data analysis for any of the monitored criteria pollutant ?**
- c) The major sources of air pollution in Mumbai are emissions from vehicles, industries, in house solid waste, hazardous wastes, hospital wastes.
 - (i) Explain the trends of RSPM and SPM Concentration for the Residential and Industrial area in the city of Mumbai.
 - (ii) The Major air polluting industries include: Thermal power plants, Fertilizer plants, Petroleum refineries, Petrochemical complex, Foundries, Iron & Steel Industries, Fertilizer Industries and Chemical Industries. Based on this discuss the Action plan for the abatement technologies for the city of Mumbai for the Industrial Pollution and Vehicular pollution.

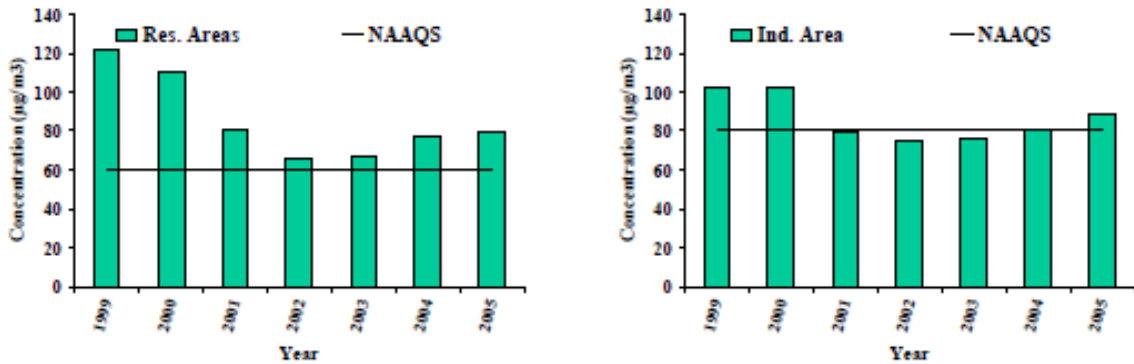


Figure 16.4: Trends in Annual Average Concentration of RSPM in Mumbai.

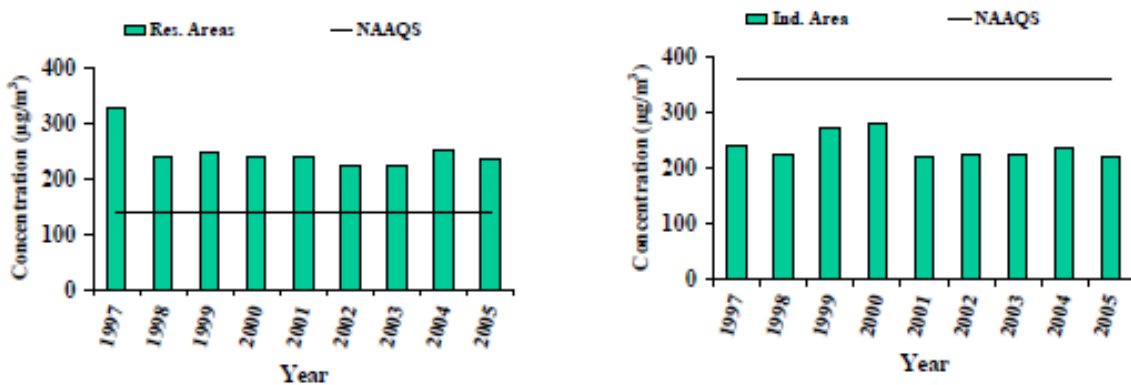


Figure 16.5: Trends in Annual Average Concentration of SPM in Mumbai.

OPEN BOOK - (30 Marks)

5. (3+3+4 = 10 Marks)

It becomes increasingly clear that safely managed drinking water, sanitation and hygiene services are vital to human health. But unless progress picks up speed – dramatically – billions of people will still lack these essential services in 2030. **The Sustainable Development Goals Report 2022 progress towards realizing the 17 Goals and one of the goal is SDG – 6 : Clean water and Sanitation.**

- a) The graph shows the percentage of sanitation services in two years and acceleration required to achieve the universal coverage by the year 2030. Which activities are to be enhanced to realize the Sanitation goals by the year 2023.



- b) Explain the Concept of Needs and Idea of Limitations while discussing the concept of Sustainability.
- c) As an instrument of sustainable development, sustainable design intends to conceive of products, processes, and services that meet the needs of society while striking a balance between economic and environmental interests. Why is this concept referred as a tough task to realize and does it drive engineers to play a role as designers ?

6. (10 Marks)

While industry may not appreciate that the target for Best Available Control Technology (BACT) is constantly changing, this fact enables the regulatory agencies to push technological advances in emission controls over time. From an environmental perspective, the best option is the one that minimizes the total emission levels of the pollutant considered. With this perspective, XYZ Company seeks approval for the construction of a tire-fueled kiln (The use of whole tires and shredded tires as a fuel source

is an alternative means of fuel that has become increasingly more in recent years in the cement, paper and electricity production industries) at a location that is in attainment with the National Ambient Air Quality Standards. The tire-fueled rotary kiln is designed to produce 150 mmBtu/hr, and is intended to operate continuously. **Carry the BACT Analysis for the Particulate Control technologies for this sector and conclude the final result .**

7. (10 Marks)

Untreated textile wastewater can cause rapid depletion of dissolved oxygen if it is directly discharged into the surface water sources due to its higher BOD value. Effluents with high levels of BOD and COD values are highly harmful to the biological life. High alkalinity and traces of chromium which is employed in dyes adversely affect the aquatic life. Answer these questions w.r.t **Effluent treatment plants (ETPs)**.

- a) On what factors design and size of ETP depends on ?
- b) Explain the working of ETP Plant with neat diagram/ or flow diagram of the ETP Plant and emphasizing on the Secondary treatment plant while discussing.