

IV B.Tech. I Semester Regular Examinations, November -2005
AIR POLLUTION AND CONTROL
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) In what ways can concentration of pollutants in air be expressed?
(b) What are the background concentrations and estimated residence times of the following, in clean dry atmospheric air? Nitrous oxide, Sulphur dioxide, Carbon dioxide, Carbon monoxide.
(c) Classify sources of air pollutants into different categories and indicate the emissions and pollutants produced. [4+4+8]
2. (a) A sample of air analysed at 0°C and 1 atm pressure is reported to contain 9 ppm of CO. Determine the equivalent CO concentration in micrograms per cubic meter and milligrams per cubic meters.
(b) Write on the major source of lead in our environment. [8+8]
3. (a) Discuss the effects of air pollutants on human health in detail
(b) What are the various air pollutants believed to be harmful to human health. [8+8]
4. (a) Explain different approaches for controlling oxides of nitrogen in combustion processes.
(b) Discuss in detail the scrubbing methods for effluent gas treatment for reduction of nitrogen oxides? [8+8]
5. Define the terms.
(a) Lapse rate.
(b) Dry adiabatic lapse rate.
(c) Inversion.
(d) Double inversion. [16]
6. Describe the flow of air around a high-pressure center in terms of its direction of rotation, its movement perpendicular to the earth's surface, and motion relative to the center. [16]
7. (a) Draw the flow diagram of alkalised alumina process and explain the process.
(b) List various methods of control of pollutants by process changes. [10+6]
8. (a) What are Internal Separators ? With a neat figure explain its principle stating the size of the particles it can effectively remove.

- (b) Describe the 'Louvred type of dust collectors' clearly stating their principle of operation, velocity at inlet and size of the particulates they can clear off.
- (c) Describe a 'Dust trap' with a neat figure clearly stating its principle of working and size of particles it can remove. [6+6+4]

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1. (a) Give some examples of chemical reactions among primary pollutants to form secondary pollutants.
(b) Trace the history of our knowledge of the photochemical production of secondary pollutants in the atmosphere. [8+8]
2. (a) Discuss the natural and anthropogenic origin of the seven major pollutants and identify the likely mechanisms for their removal from the atmosphere.
(b) List four common features of air pollution episodes and identify the locations of three "Killer" episodes. [8+8]
3. (a) What is dose response curve? How do we establish the dose response curve for a pollutant?
(b) Discuss in detail the harmful effects of air pollutants on materials. [8+8]
4. (a) What are the different sources of emission of carbon monoxide? What are the ill effects of it on human health when it is present in different % of blood hemoglobin connected to COHb.
(b) Explain removal mechanisms of carbon monoxide. [8+8]
5. With the help of neat figures explain the terms
(a) Radiation inversion
(b) Subsidence inversion
(c) Double inversion. [16]
6. Describe the flow of air around a low-pressure center in terms of its direction of rotation, its movement perpendicular to the earth's surface, and motion relative to the center. [16]
7. (a) What are the factors affecting photo-chemical reactions? Write the photo chemical reaction of nitrogen dioxide and sulphur dioxide.
(b) Explain the effects of photo-chemical smog on human beings and plants. [10+6]
8. (a) With a neat figure describe the functioning of a 'Cyclone separator.'
(b) What is 'High efficiency cyclone separator'? Give out the relationship between different dimensions for a high efficiency cyclone separator. [8+8]

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1. (a) Name the various pollutants causing air pollution and describe the role played by them.
(b) What do you understand by the following terms as used in air pollution?
 - i. Smog
 - ii. Acid rain
 - iii. Air zoning
 - iv. Dilution

[8+8]
2. (a) Oxygen plays a key role in the troposphere, while ozone in the stratosphere - Elucidate.
(b) Trace the origin of organic particulate matter in the atmosphere.

[8+8]
3. (a) What are the different solutions to protect the ozone layer?
(b) Enumerate the term Acid Rain? What are the different chemicals involved in acid rain ? Explain in detail.

[8+8]
4. (a) List out various Green House gases ? Explain them in detail
(b) Discuss in detail global annual fuel combustion Co2 emissions

[8+8]
5. Explain the following.
 - (a) Effect of water bodies on pollutant dispersion
 - (b) Effect of Ridges/Buildings on plume dispersion.

[8+8]
6. (a) Discuss why it is important to know the maximum mixing depth when calculating the atmospheric concentration of air pollutants?
(b) Discuss how an inversion beginning at an elevation of 500m affects an air pollution.

[8+8]
7. (a) Explain Alkalized alumina process of dry method.
(b) Draw the flow diagram of manganese oxide process of dry method.

[10+6]
8. Draw a neat proportionate figure of a cyclone separator clearly mentioning its
 - (a) Inlet dia
 - (b) length of uniform dia.

- (c) tapering length
- (d) dia. of dust outlet
- (e) dia. for pure air escape

Also show the main Vortex and Vortex core. Describe its working and factors controlling efficiency. [16]

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1. (a) What are the principal chemical reactions that take place in the Chemosphere to give it its name?
(b) How do they influence stratospheric and tropospheric chemical reactions. [8+8]
2. (a) What are the two chemical components that are necessary ingredients for the production of photochemical smog? Also state on a national basis, what are the principal sources of SO_x emissions to the atmosphere?
(b) Discuss the causes and relevance of diurnal variation in NO and NO₂. [8+8]
3. (a) Discuss in detail combustion kinetics of burning of solids.
(b) Explain how the reduction of sulphur takes place in combustion process. [8+8]
4. (a) Explain the effects of various fumigants on plants.
(b) What do you know about time-concentration equations? How the degree of leaf destruction can be assessed using these equations. [8+8]
5. Explain the following.
(a) Effect of valleys on pollutant concentrations.
(b) Effect of Terrain roughness on Dispersion. [8+8]
6. With respect to air pollution discuss the importance of Rainfall & Precipitation and high and low pressures. [16]
7. (a) What are the modifications of operating conditions for reducing the NO_x formation explain?
(b) What are the modifications of design conditions. [10+6]
8. (a) What is a Wet Scrubber ? Compare the major type of Wet Scrubbers by having the following columns.
 - i. Classification of Wet Scrubber
 - ii. Mechanism responsible for particle capture
 - iii. How the liquid is applied
 - iv. Different types of Scrubbers operating in this category.
(b) What are the advantages of "Wet Scrubbers" over 'Fabric Filters'. [10+6]
