

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION SP/2025)

CLASS: BTECH  
BRANCH: CHEMICAL ENGG.

SEMESTER : VI  
SESSION : SP/2025

SUBJECT: CL353 POLLUTION CONTROL AND EQUIPMENT DESIGN

TIME: 03 Hours

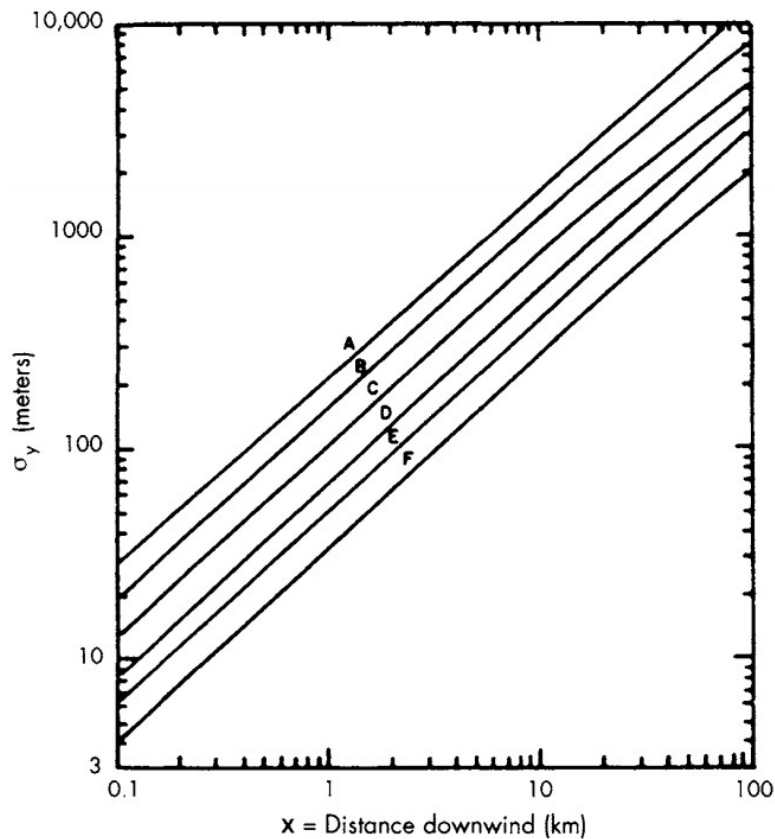
FULL MARKS: 50

INSTRUCTIONS:

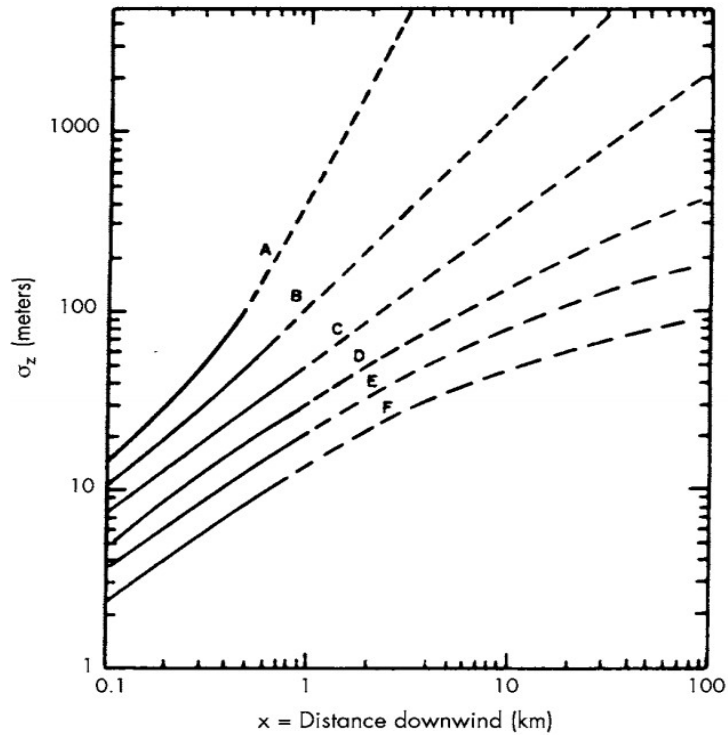
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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- 1 Answer the following questions. CO BL
- Q.1(a) An automobile emits 10000 ppm CO at 92 °C. Estimate the weight density of CO at the tailpipe. [5] 1 2
- Q.1(b) Use 3R strategies to address the pollution caused by beer and soda cans accumulated at the dump. [5] 1 3

- 2 Answer the following questions based on the dispersion curves.



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- Q.2(a) An automobile emits 0.6 g/min of CO while idling at a traffic junction on a summer day, with hardly any wind. Obtain the CO concentration 2 km downwind from the tailpipe. [5] 2 4
- Q.2(b) A thermal power plant emits 0.006 g/min of SO<sub>2</sub> from a 70 m high stack with a highly stable ambient and wind speed of 2.5 m/s. Comment on the shape of plume formed downwind and use that information to estimate the ground concentration of SO<sub>2</sub> 20 km downwind. [5] 2 4
- 3 Answer the following questions pertaining to the analysis of water pollution.
- Q.3(a) Sketch the sag curves under following conditions: [5] 3 4  
 - waste source: dairy; biological oxygen demand: 2000 ppm  
 - waste source: brick kiln; biological oxygen demand: 5 ppm  
 - waste source: urea mixed in farm water; biological water demand: 10<sup>5</sup> ppm  
 - waste source: electroplating unit; biological oxygen demand: 0
- Q.3(b) How would you estimate D and L at the source of water pollution, assuming that a wastewater stream meets a river at the source of water pollution? [5] 3 4
- 4 Answer the following questions.
- Q.4(a) For a household water purifier, arrange the sequence of treatment methods and other support systems from among the following. [5] 4 4  
 pH balance filter, check valve, carbon filter, water supply tube, sediment pre-filter, drain flow line, activated carbon filter, UV disinfection device, water tap, RO unit, water storage tank
- Q.4(b) A settling tank is 3 m deep, 10 m long, and 4 m wide. If the influent enters at 10 m<sup>3</sup>/min, answer the following. [5] 4 4  
 (i) What is the bulk velocity of water as it moves through the tank?  
 (ii) What is the residence time in this tank?  
 (iii) If the particles suspended 1 m above the bottom of the tank fully settle at the bottom, what is the fraction of solids removed by settling?
- 5 Answer the following questions.
- Q.5(a) Sketch a flow diagram and show design features of a method for on-site solid waste disposal. [5] 5 4
- Q.5(b) A family of four wants to build a house on a lot for which the seepage rate is 1 mm/min. Septic tank must have a residence time of 24 hrs. Assuming that each person contributes 100 l/day of wastewater, find the volume of the septic tank required and the area of the seepage pit. [5] 5 4