GUJARAT TECHNOLOGICAL UNIVERSITY

[BE-7 SEMESTER] – OLD PAPER –S22 TO S26 – QUESTION BANK

Subject Name & Code: Design of Air Pollution Control Equipment's- 3171307

Chapter 1: Design Fundamentals and Elements of Air Pollution Control System

Repeated Questions:

1. Pressure Terms and Pressure Drop:

- **Q.** Define/explain pressure terms used in air pollution control system design: (a) Absolute pressure (b) Gauge Pressure (c) Static Pressure; also Static pressure, Dynamic pressure, Total pressure; also differentiate Absolute pressure, Gauge pressure and differential pressure. **(P5, 3 Marks; WINTER 2024; SUMMER 2025)**
- **Q.** Define following terms: 1. Gauge Pressure 2. Capture velocity 3. Friction loss. **(P2, 3 Marks OR; WINTER 2025, 3 Marks)**

2. Hoods:

- **Q.** Hood-related questions: Draw any one hood system and explain in detail; enlist types of hoods and explain any one with applications; explain different types of hoods used in APCS; list different types of hoods with characteristics and industrial applications; differentiate enclosing hood and receiving hood. [Diagram required – refer to the original question paper] **(P2, 4 Marks OR; P4, 3 Marks OR; P5, 7 Marks; SUMMER 2025; WINTER 2025, 7 Marks; WINTER 2025)**

3. Duct System:

- **Q.** Duct system/design: Define duct system and explain basic principles in duct design; state design considerations for designing duct system; explain role of ducts in APCS; enlist points to be considered while design of duct. **(P0, 4 Marks OR; P1; P2, 4 Marks OR; SUMMER 2025; WINTER 2025, 4 Marks)**

4. Fans and Blowers:

- **Q.** Fans: List centrifugal fans and axial fans with characteristics and industrial applications; enlist and explain types of fans with applications; differences between centrifugal fans and axial fans and when each used; selection criteria of fans; differentiate centrifugal fan and axial fan. **(P0, 3 Marks OR; P1; P2, 4 Marks OR; P4, 7 Marks; WINTER 2024, 4 Marks; SUMMER 2025; WINTER 2025, 3 Marks OR)**
- **Q.** Differentiate between ID fan and FD fan. **(P0, 3 Marks; P5, 3 Marks; WINTER 2025)**

5. Auxiliary Equipment and Dust Transport:

- **Q.** Auxiliary equipment: Enlist Auxiliary Equipments; highlight importance; explain any one in detail; write short note on auxiliary equipment used in APCS; enlist auxiliary equipment used in pollution control scheme along with objectives. **(P0, 4 Marks; P2, 7 Marks; P5, 3 Marks; WINTER 2024)**
- **Q.** Enlist and explain types of systems used to transport the dust to the collector; draw neat sketches. [Diagram required – refer to the original question paper] **(P2; P4, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

Other Important Questions:

1. Pressure Terms and Pressure Drop:

- **Q.** Highlight concept of pressure drop in air pollution system with neat sketch. [Diagram required – refer to the original question paper] **(P1, 4 Marks)**

2. Hoods:

- **Q.** Write a short note on hood. **(P0, 3 Marks)**

3. Fans and Blowers:

- **Q.** What is the difference between a fan and a blower in the context of air pollution control systems? **(WINTER 2024)**

4. Auxiliary Equipment and Dust Transport:

- **Q.** Enlist different types of dust handling equipments and explain pneumatic conveyors in detail. **(WINTER 2025, 4 Marks)**

Chapter 2: Selection of Air Control Equipment

Repeated Questions:

1. Effect of Temperature, Pressure and Dew Point:

- **Q.** Effect of temperature/pressure/dew point on selection of Air Pollution Control Equipment: How does dew point affect selection; explain effect of temperature and pressure; how temperature affects APCS and what corrections used for; effect of temperature as parameter in selection. **(P4; P5; WINTER 2024; SUMMER 2025)**

2. Dust Characteristics and Selection Parameters:

- **Q.** Dust characteristics affecting choice and design of APCE; role of dust characteristics in selecting APCE; explain hygroscopic, abrasive, sticky, explosive, agglomerating dust characteristics. **(P4; P5; WINTER 2024; SUMMER 2025; WINTER 2025, 7 Marks)**

Other Important Questions:

1. Effect of Temperature, Pressure and Dew Point:

- **Q.** What is the effect of temperature as parameter in selection of Air Pollution Control Equipment? **(P4)**

2. Dust Characteristics and Selection Parameters:

- **Q.** State points to be considered while designing Dust system. **(P5, 7 Marks OR)**
- **Q.** What is the key process parameters involved in the selection of air control equipment? Explain each in detail. **(WINTER 2024 OR)**

3. Collector Efficiency (Numerical):

- **Q.** To determine the efficiency of dust collector and the dust collected at the bottom of the hopper for the following data: Volume = 157000 m^3/hr; Temp. = 150°C; Inlet dust concentration = 89 gm/m^3; outlet dust concentration = 100 mg/m^3. **(P0)**

Chapter 3: Cyclone Separators

Repeated Questions:

1. Cyclone Separator (Theory):

- **Q.** Discuss the operation and maintenance issues of Cyclone separator. **(P0, 3 Marks; P2; P5, 3 Marks)**

Other Important Questions:

1. Cyclone Separator (Theory):

- **Q.** Draw plan and section of Cyclone Separator. [Diagram required – refer to the original question paper] **(P2)**
- **Q.** Explain the effect of following parameters on performance of cyclone separator: (i) Cyclone diameter (ii) Inlet velocity (iii) Gas temperature. **(P4)**
- **Q.** Enlist and explain the performance parameter of cyclone separator. **(P5, 7 Marks)**
- **Q.** How to increase the efficiency of the cyclone Separator? **(WINTER 2025, 4 Marks)**
- **Q.** What are the major limitations of cyclone separators compared to other pollution control devices? **(SUMMER 2025, 3 Marks)**
- **Q.** How does centrifugal force contribute to particle separation in a cyclone separator? **(SUMMER 2025, 3 Marks OR)**
- **Q.** Define and explain the term "centrifugal separation" in the context of cyclone separator. **(WINTER 2024)**
- **Q.** What are the key design parameters used in cyclone separator calculations? **(WINTER 2024)**

2. Cyclone Separator – Design and Numerical Problems:

- **Q.** Calculate pressure drop for the cyclone separator. (Conventional Cyclone) Dc = 1.4 m; Vi = 12.76 m/sec; Gas density = 0.895 kg/m³; Inlet dust loading = 100 mg/m³. **(P1)**
- **Q.** Determine the Saltation velocity of conventional cyclone separator: Q = 10 m³/Sec; g = 9.81; ρg = 1.185 kg/m³; ρp = 2000 kg/m³; Vi = 21 m/sec; assume suitable data; μg = 1.85×10^{-5} kg/m·sec. **(P2 OR)**
- **Q.** Determine the Saltation velocity of conventional cyclone separator: Q = 8 m³/Sec; g = 9.81; ρg = 1.185 kg/m³; ρp = 1800 kg/m³; Vi = 22 m/sec; assume suitable data; μg = 1.85×10^{-5} kg/m·sec. **(SUMMER 2025 OR)**
- **Q.** A cyclone with body diameter 1.6 m processes 4.5 m³/s of air having temperature 75°C. Determine cut size diameter if density of particles is 1200 kg/m³. Assume number of turns 5 and kinematic viscosity 2.07×10^{-5} kg/m·s and density of air 1.014 kg/m³. **(P4)**
- **Q.** Determine the cut size diameter and overall collection efficiency of a cyclone separator based on particle size distribution of dust given in table. Assume gas viscosity = 2.1×10^{-5} kg/m·s, density of particles = 1500 kg/m³, Inlet gas velocity = 21.5 m/s, Ne = 6, inlet width = 0.32 m, density of gas = 0.9466 kg/m³. [Diagram required – refer to the original question paper] **(P4)**
- **Q.** A high efficiency cyclone with dia. 1500 mm handles 5 m³/s of standard air carrying particles with density 1700 kg/m³. Determine cut size dia. with gas density 1.185 kg/m³. (Assume μg = 1.84×10^{-5} kg/m·s) **(P5)**
- **Q.** A cyclone with body diameter 1 m processes 4.5 m³/s of air having temperature 100°C. Determine cut size diameter if density of particles is 1300 kg/m³. Assume number of turns 5 and kinematic viscosity 2.01×10^{-5} kg/m·s and density of air 1.014 kg/m³. **(WINTER 2024)**
- **Q.** A cyclone with body diameter 1.5 m processes 5 m³/s of air having temperature 100°C. Determine cut size diameter and critical size diameter if density of particles is 1800 kg/m³. Assume number of turns 5, kinematic viscosity 2.02×10^{-5} kg/m·s and density of air 1.014 kg/m³. **(SUMMER 2025)**

- **Q.** A Conventional cyclone with a diameter of 1.5 m handles 8 m^3/s of standard air carrying particles with density 1800 kg/m^3. Determine cut size diameter for 5 nos. of effective turn with gas density 1.2 kg/m^3. Assume flue gas viscosity = 1.85×10^{-5} kg/m·sec. **(SUMMER 2026, 4 Marks OR)**
- **Q.** Design a cyclone separator for a flow rate of 50,000 m^3/hr. Density of particles 1400 kg/m^3. Kinematic viscosity of air 2.07×10^{-5} kg/m·s. Temperature 100°C. Assume inlet velocity = 20.5 m/s. **(P4)**
- **Q.** Design a cyclone separator for a flow rate of 20,000 m^3/hr. Density of particles 1600 kg/m^3. Kinematic viscosity of air 2.07×10^{-5} kg/m·s. Temperature 100°C. Assume inlet velocity = 22 m/s. **(SUMMER 2025, 7 Marks OR)**
- **Q.** To find out conventional cyclone diameter for duty conditions: Gas Volume = 12500 m^3/hr; Temperature = 200°C; Gas Density at 20°C = 1.2 kg/m^3; Inlet Velocity = 19 m/sec. **(WINTER 2025, 7 Marks)**
- **Q.** Determine efficiency of conventional cyclone separator to recover solids from air stream with volumetric flow-rate 5000 m^3/h at atmospheric pressure and temperature 100°C. Screen analysis of solid particle size distribution to be removed is given below with estimated density of solid particles 2800 kg/m^3. Assume suitable data. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** Design a cyclone separator of maximum particle collection efficiency for 90000 m^3/hr gas stream at 100°C. Consider gas to be air releasing 500 g/m^3 of dust. Dust mean diameter 10 µm and ρp = 2000 kg/m^3. Estimate pressure drop and collection efficiency. Take flue gas viscosity 2.1×10^{-5} at 100°C. Gas Density = 0.9466 kg/m^3, G = 551.3. **(SUMMER 2026, 7 Marks OR)**
- **Q.** Our cyclone separator operating with Dcut = 5 µm. It is now necessary to increase the flow rate to cyclone by 30%. Nothing else will be changed. Estimate new Dcut. **(P0, 4 Marks OR)**
- **Q.** A conventional type cyclone separator has 1 m diameter. Flow is 150 m^3/min and particle density is 1600 kg/m^3. Find out the collection efficiency for following particle size distribution. Assume suitable data. [Diagram required – refer to the original question paper] **(P0, 7 Marks)**

Chapter 4: Fabric Filters

Repeated Questions:

1. Fabric Filter (Theory):

- **Q.** Explain the term Air to cloth ratio. What is its importance in design of bag filter? **(P2, 3 Marks; P4, 3 Marks OR)**
- **Q.** Discuss operation and maintenance issues of Bag Filter. **(P0, 3 Marks OR; WINTER 2024, 4 Marks OR)**
- **Q.** Explain methods to improve efficiency of bag filter. **(P2, 3 Marks OR; P4, 4 Marks OR)**
- **Q.** Draw plan and section of Bag filter. [Diagram required – refer to the original question paper] **(P0, 4 Marks; P5, 4 Marks OR; WINTER 2025)**

2. Fabric Filter – Design and Numerical Problems:

- **Q.** A bag house filter having 20 compartments, 360 bags per compartment and each bag having diameter 11 m and length 30 m with gas flow rate 12 lakh m^3/min. Calculate A/C ratio. Assume 2 compartments are out of service. **(P0 OR; SUMMER 2025, 7 Marks)**
- **Q.** To find out the height of pyramid hopper for a fabric filter collecting carbon dust having valley angle of 60°. Top dimensions 3.1 m × 3.4 m and bottom dimensions 0.3 m × 0.3 m. **(P1; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Fabric Filter (Theory):

- **Q.** Enlist the disadvantages of Bag filter. **(P2)**
- **Q.** Write a short note on Pulse jet type bag filter. **(P4)**
- **Q.** Enlist various types of bag material used as a bag filter media along with their suitability to handle various type of dust. **(P5, 3 Marks OR)**
- **Q.** Describe the basic principle behind the operation of a fabric filter. **(WINTER 2024 OR)**
- **Q.** How do temperature and humidity impact the performance of fabric filters? **(SUMMER 2025, 4 Marks)**
- **Q.** What are the common causes of bag failure in fabric filters, and how can they be prevented? **(SUMMER 2025, 4 Marks OR)**

2. Fabric Filter – Design and Numerical Problems:

- **Q.** A filter has 1000 m^2 face area and 9 m^3/s of air carrying dust concentration 0.001 kg/m^3. Assume RF = 20000 N·s/m^3 and RP = 25000 s^{-1}. If filter must be clean when pressure drop = 2100 N/m^2, after what period of time must cleaning occur? **(P1)**
- **Q.** Design Bag filter for the flow of 15 m^3/sec. **(P2)**
- **Q.** A cloth filter has Rf and Rp resistance values of 40,000 kg/m^2-s and 23000 s^{-1} respectively. Filter area 5000 m^2, flow rate of air 60 m^3/s, dust loading 5 g/m^3. If total pressure drop is to be kept at 450 N/m^2, determine: (1) Pressure drop at start up in N/m^2 and Pa (2) Pulse pressure drop in N/m^2 and Pa (3) Duration of operation. **(P4 OR)**
- **Q.** Design a bag filter for a boiler using lignite having following ultimate analysis. Fuel consumption 30 TPD. Bag filter inlet temperature 120°C. Carbon = 58.8, Hydrogen = 4.17, Sulphur = 0.5, Nitrogen = 0.91, Oxygen = 13.6 (in %). **(P4, 7 Marks OR)**
- **Q.** Air at 80°C passes through a fabric filter for 6 hr after which total pressure drop is 1.18 kPa. Filter cake density 1300 kg/m^3 and residual pressure drop 137 Pa. Air velocity 1.28 m/min and initial waste loading 32 gm/m^3. Estimate permeability Kp of dust layer in m^2. **(P5)**
- **Q.** A cloth filter has Rf and Rp resistance values of 30,000 kg/m^2-s and 18000 s^{-1} respectively. Filter area 3000 m^2, flow rate of air 60 m^3/s, dust loading 5 g/m^3. Total pressure drop kept at 450

N/m^2, determine: (1) Pressure drop at start up in N/m^2 and Pa (2) Pulse pressure drop in N/m^2 and Pa (3) Duration of operation. **(WINTER 2024)**

- **Q.** A cloth filter has Rf and Rp resistance values of 50,000 kg/m^2-s and 20000 s^{-1} respectively. Filter area 4500 m^2, flow rate of air 50 m^3/s, dust loading 5 g/m^3. Total pressure drop kept at 450 N/m^2, determine: (1) Pressure drops at start up in N/m^2 and Pa (2) Pulse pressure drop in N/m^2 and Pa (3) Duration of operation. **(SUMMER 2025)**
- **Q.** A bag house to be constructed to control emissions from a grain elevator. Filter bags measure 0.3 m diameter and 6 m length. System controls 21 m^3/s air flow. A/C ratio 0.0152 m/s, tr = 9 min, tc = 2.5 min. Determine: 1. No. of bags 2. No. of compartments 3. No. of bags in each compartment 4. Filtration time (tr). **(WINTER 2025, 7 Marks)**
- **Q.** Calculate the length and width and height of bag filter and hopper dimension and design a bag filter for a flow of 8 m^3/s. A/C ratio 1.5 cm/s. Bag diameter = 0.2 m; Bag height = 2.5 m. **(SUMMER 2026, 7 Marks)**
- **Q.** A cloth filter has RF and RP resistance values of 25000 kg/m^2 and 50000 1/s respectively. Filter area 15000 m^2, volumetric flow rate 10 m^3/s, dust loading 10 g/m^3. Determine pressure drop at startup in N/m^2 and millibar. **(SUMMER 2026, 4 Marks)**

Chapter 5: Electrostatic Precipitator

Repeated Questions:

1. Electrostatic Precipitator (Theory and Diagrams):

- **Q.** Advantages and disadvantages of ESP. **(P5, 4 Marks OR; WINTER 2024)**

2. Electrostatic Precipitator – Numerical Problems:

- **Q.** An ESP with specific collection area of 0.984 $m^2/m^3 \cdot min$ is found to have actual overall efficiency 97%. If A/Q is increased to 1.5 $m^2/m^3 \cdot min$, estimate anticipated collection efficiency on basis of Deutsch and Hazen equation. Assume n = 4. **(P0, 7 Marks; P2)**

Other Important Questions:

1. Electrostatic Precipitator (Theory and Diagrams):

- **Q.** Draw a section view of Electrostatic precipitator. [Diagram required – refer to the original question paper] **(P1, 3 Marks)**
- **Q.** Draw a detailed plan and section view of Electrostatic precipitator. [Diagram required – refer to the original question paper] **(P2)**
- **Q.** Explain particle removal mechanism of ESP from flue gas. **(P2)**
- **Q.** Define following terms: (1) Drift velocity (2) Migration Velocity (3) Back corona. **(P5, 3 Marks OR)**
- **Q.** Enlist and explain parameters to be considered in selecting ESP as Air Pollution Control Equipment. **(P4, 3 Marks OR)**
- **Q.** Draw a neat sketch of ESP. [Diagram required – refer to the original question paper] **(P0, 4 Marks)**
- **Q.** State advantages and disadvantages of electrostatic precipitator. **(WINTER 2024)**
- **Q.** Define the terms "drift velocity" and "collection efficiency" as they relate to ESPs. **(WINTER 2024, 3 Marks OR)**
- **Q.** Explain the basic working principle of an electrostatic precipitator. **(SUMMER 2025, 3 Marks)**
- **Q.** Define terms: (1) Drift velocity (2) Migration velocity (3) Collection efficiency. **(SUMMER 2025, 4 Marks)**
- **Q.** Write definition of: Migration velocity, Resistivity in ESP, Aspect ratio. **(SUMMER 2026, 3 Marks)**

2. Electrostatic Precipitator – Numerical Problems:

- **Q.** A horizontal parallel plate ESP consists of a single duct 7 m length and 6 m depth with 270 mm plate to plate spacing. Given collecting efficiency at gas flow rate 120 m^3/min. Determine bulk velocity of gas, drift velocity of gas, and outlet loading of ESP. Inlet loading = 6.5 g/m^3; Collection efficiency = 88%. **(P1 OR)**
- **Q.** An Electrostatic precipitator with specific collection area 0.984 $m^2/m^3/min$ is found to have overall collection efficiency 97%. If A/Q is increased to 1.315 $m^2/m^3/min$, estimate anticipated collection efficiency on basis of Deutsch and Hazen Equation. Take n = 4. **(P1)**
- **Q.** An ESP with specific collection area 0.984 $m^2/m^3 \cdot min$ is found to have actual overall efficiency 97%. If A/Q is increased to 1.7 $m^2/m^3 \cdot min$, estimate anticipated collection efficiency on basis of Deutsch and Hazen equation. Assume n = 5. **(P5, 7 Marks OR)**
- **Q.** Calculate drift velocity of 4 µ diameter particles in m/s at 25°C. Charging and collecting voltages 40,000 V and 30,000 V respectively. Anode and cathode spacing 10 cm. Assume dielectric factor 3 and viscosity 1.84×10^{-5} kg/m·s. Apply Cunningham correction factor. **(P4, 4 Marks)**
- **Q.** The efficiency of ESP is 98%. Efficiency drops to 93% as result of flow rate changes. Calculate ratio of flow rate of above situation. **(P0, 7 Marks OR)**

- **Q.** An ESP with specific collection area 0.998 $m^2/m^3 \cdot min$ is found to have actual overall efficiency 95%. If A/Q is increased to 1.3 $m^2/m^3 \cdot min$, estimate anticipated collection efficiency on basis of Deutsch and Hazen equation. Assume n = 4. **(WINTER 2024, 7 Marks)**
- **Q.** An ESP with specific collection area 0.925 $m^2/m^3 \cdot min$ is found to have actual overall efficiency 96%. If A/Q is increased to 1.5 $m^2/m^3 \cdot min$, estimate anticipated collection efficiency on basis of Deutsch and Hazen equation. Assume n = 5. **(SUMMER 2025, 7 Marks)**
- **Q.** Consider a plate type collector with overall spacing (between two electrodes) 24 cm, applied voltage 60 kW. Mean gas velocity through collector 1.5 m/s. Estimate collecting plate length required for collection efficiency 100% for 0.5 µm particles. Assume P = 2, Ec = Ep, omit Cunningham coefficient. $\mu g = 2.4 \times 10^{-5}$ kg/m·s @420 K. **(WINTER 2025, 7 Marks)**

Chapter 6: Wet Scrubbers

Repeated Questions:

1. Cyclonic Scrubber:

- **Q.** Explain principle, construction and working of cyclonic scrubber along with neat sketch; also brief/short note on cyclonic scrubber with neat sketch. [Diagram required – refer to the original question paper] **(P0, 7 Marks OR; P2 OR; P4, 7 Marks OR; WINTER 2024 OR; SUMMER 2025 OR)**

2. Spray Tower:

- **Q.** Write a short note on Spray Tower with neat sketch. [Diagram required – refer to the original question paper] **(P0, 7 Marks; P2, 7 Marks OR)**

3. Venturi Scrubber (Theory):

- **Q.** Discuss operation and maintenance issues of venturi Scrubber. **(P0, 3 Marks OR; P5, 4 Marks; SUMMER 2025)**
- **Q.** State advantages and limitations/disadvantages of venturi scrubber. **(P2, 4 Marks; P4; SUMMER 2025 OR)**

4. Venturi Scrubber – Design and Numerical Problems:

- **Q.** Calculate gas velocity at throat of venturi scrubber; draw design sketch. [Diagram required – refer to the original question paper] **(P0 - Q = 5 m^3/s, throat dia. 150 mm OR; P2 - Q = 2.5 m^3/s, throat dia. 150 mm; WINTER 2024 - Q = 3 m^3/s, throat dia. 150 mm)**
- **Q.** Design/determine dimensions of venturi scrubber for given data and draw neat design sketch. [Diagram required – refer to the original question paper] **(P0; P1 OR; P4; P5; WINTER 2024, 7 Marks; SUMMER 2025 OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Calculate Liquid to gas ratio for scrubber system with gas flow rate 113.2 m^3/min and recirculation liquid flow rate 7580 L/min; calculate inertial impaction factor for dp = 1.15 µm, particle density = 1500 kg/m^3, Vr = 80 m/sec, do = 96 µm, µg = 1.84×10^{-5} kg/m·sec. **(P1; WINTER 2025, 7 Marks)**
- **Q.** Determine dimensions of venturi scrubber to control particulate matter in flue gas from wood fired boiler: Q = 0.87 m^3/sec; Temperature of gas = 220°C; L/G ratio = 1.3 L/m^3; assume suitable data; draw neat design sketch. [Diagram required – refer to the original question paper] **(P1 OR; WINTER 2025, 7 Marks OR)**

Other Important Questions:

1. Types of Scrubbers (General):

- **Q.** Enlist various types of scrubbers & briefly explain any two types with neat sketch. [Diagram required – refer to the original question paper] **(P2)**

2. Cyclonic Scrubber:

- **Q.** Highlight importance of cyclonic scrubber for gaseous pollutant removal. **(P1 OR)**

3. Spray Tower:

- **Q.** Draw a neat sketch of Spray Tower. [Diagram required – refer to the original question paper] **(P1)**
- **Q.** Highlight importance of Spray tower for gaseous pollutant removal. **(WINTER 2025, 3 Marks OR)**

4. Venturi Scrubber (Theory):

- **Q.** With the help of neat sketch explain components of venturi scrubber. [Diagram required – refer to the original question paper] **(P4, 4 Marks OR)**
- **Q.** Enlist and explain operational problems of Venturi scrubber. **(P4, 4 Marks OR)**
- **Q.** Explain significant particulate matter removal mechanisms of venturi scrubber. **(P5, 3 Marks)**

- **Q.** How does throat section of a venturi scrubber contribute to pollutant removal? **(WINTER 2024, 4 Marks)**

5. Venturi Scrubber – Design and Numerical Problems:

- **Q.** Calculate dimensions of a venturi scrubber: Volumetric flow rate of process gas stream = 20 m^3/min; Density of dust = 1500 kg/m^3; Liquid-to-gas ratio = 0.4 l/m^3; Average particle size = 7 µm; Water droplet size = 41 microns; Throat velocity = 80 m/s. **(P4)**
- **Q.** Design a venturi scrubber for a flow of 13,000 m^3/hr with L/G ratio = 2.5 L/m^3, assume relative velocity 50 m/s, diameter of particle = 5 µm, Vr = 60 m/sec. **(P5)**
- **Q.** Design a venturi scrubber for a flow of 10,000 m^3/hr with L/G ratio = 2.5 L/m^3, assume relative velocity between 30 to 120 m/s (60 m/sec), diameter of particle = 5 µm, convergent angle 17° and divergent section 6°. **(P0)**
- **Q.** Calculate dimensions of a venturi scrubber: Volumetric flow rate = 18 m^3/min; Density of dust = 1400 kg/m^3; Liquid-to-gas ratio = 0.4 l/m^3; Average particle size = 5 µm; Water droplet size = 41 microns; Throat velocity = 75 m/s. **(WINTER 2024, 7 Marks)**
- **Q.** Calculate dimensions of a venturi scrubber: Volumetric flow rate of process gas stream = 15 m^3/min … [Data truncated in source – refer to the original question paper] **(SUMMER 2025 OR)**

Chapter 7: Absorption Tower and Adsorption Tower

Repeated Questions:

1. Adsorption vs Absorption; Adsorbents and Terms:

- **Q.** Differentiate between adsorption and absorption (tower/process/mechanism). **(P2; P4, 3 Marks; P5, 3 Marks OR; SUMMER 2025, 3 Marks OR; WINTER 2025, 4 Marks OR)**
- **Q.** Enlist various adsorbents for control of gaseous pollutants / make list of adsorbents and explain any one in brief. **(P2; P5, 4 Marks OR)**

2. Absorption Tower – Mass Balance and Packed Column:

- **Q.** Make a necessary Mass balance of an Absorption Tower. **(P1; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Adsorption vs Absorption; Adsorbents and Terms:

- **Q.** Define following terms: 1. Adsorbent 2. Adsorbate 3. Solubility. **(WINTER 2025, 3 Marks)**

2. Absorption Tower – Mass Balance and Packed Column:

- **Q.** Explain Packed Column as gas adsorption equipment with a neat diagram. [Diagram required – refer to the original question paper] **(P5, 7 Marks OR)**

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