Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023
Subject Code:3171307   **Date:14-12-2023**
Subject Name: Design of Air Pollution Control Equipments
Time: 10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
  1. **Attempt all questions.**
  2. **Make suitable assumptions wherever necessary.**
  3. **Figures to the right indicate full marks.**
  4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define following terms: (a) Absolute pressure (b) Gauge Pressure (c) Static Pressure	**03**
	(b)	How does the parameter dew point affect the selection of Air Pollution Control Equipment?	**04**
	(c)	Explain the effect of temperature and pressure as parameter in selection of Air Pollution Control Equipment?	**07**
Q.2	**(a)**	Enlist auxiliary equipment used in pollution control scheme along with their objectives.	**03**
	(b)	Define the following terms (1) Air – to – cloth ratio (2) Filter drag (3) Capture Velocity (4) Cut size diameter	**04**
	(c)	Enlist and explain the various Physical and Chemical characteristic of dust, required to know before designing any dust Collector equipment.	**07**
		OR	
	(c)	State points to be considered while designing Duct system.	**07**
Q.3	**(a)**	Discuss the operation and maintenance issues of Cyclone separator.	**03**
	(b)	A high efficiency cyclone with dia. of 1500 mm handles 5 m^3/s of standard air carrying particles with density of 1700 kg/m^3.Determine cut size dia. with gas density of 1.185 kg/m^3. (Assume μg=1.84 x10^{-5} kg/m.s)	**04**
	(c)	Enlist and explain the performance parameter of cyclone separator.	**07**
		OR	
Q.3	**(a)**	Enlist various types of bag material used as a bag filter media along with their suitability to handle various type of dust.	**03**
	(b)	Draw detailed plan and section of bag filter.	**04**
	(c)	Air at 80˚ C passes through a fabric filter for a period of 6 hr after which the total pressure drop is measured as 1.18 kpa. The filter cake density is 1300 kg/m^3 and the residual pressure drop across the filter is 137 pa. The air velocity is maintained at 1.28 m/min during the test and the initial waste loading is 32 gm/m^3. Estimate the permeability (Kp) of the dust layer in the unit of m^2.	**07**
Q.4	**(a)**	Explain the significant particulate matter removal mechanisms of venture scrubber.	**03**
	(b)	Discuss the operation and maintenance issues of venturi Scrubber.	**04**
	(c)	Design a venturi scrubber for a flow of 13,000 m^3/hr with following data : L/G ratio = 2.5 L/m^3 , assume relative velocity is 50 m/s. Diameter of particle = 5μm. Vr = 60 m/sec	**07**

Q.4 **(a)** Define the following terms (1) Drift velocity (2) Migration Velocity (3) Back corona **03**

(b) Enlist advantages and disadvantages of ESP detail. **04**

(c) An ESP with specific collection area of 0.984 m^2/m^3.min is found to have an actual overall efficiency of 97 %. If the value of A/Q is increase to 1.7 m^2/m^3.min. Estimate anticipated collection efficiency on basis of deutsch equation and hazen equation. Assume n = 5 **07**

Q.5 **(a)** Give the difference between ID fan and FD fan **03**

(b) Explain importance of particle size distribution and process selection. **04**

(c) Enlist the types of hoods and explain any one along with its applications. **07**

Q.5 **(a)** Differentiate between Adsorption and Absorption process as an air pollution control mechanism. **03**

(b) Make a list of adsorbents used and explain any one in brief. **04**

(c) Explain Packed Column as gas adsorption equipment with a neat diagram. **07**

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