# GUJARAT TECHNOLOGICAL UNIVERSITY
## BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

**Subject Code:3163511**                                        **Date:03/06/2022**
**Subject Name:Air Pollution Contol - II**
**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)** | What do you understand by Air Quality Modeling?                                                               | **03** |
|        | **(b)** | Explain working principle of fabric filter with the help of neat diagram                                        | **04** |
|        | **(c)** | Discuss Gaussian Plume model with various modifications. Also mention assumption of this model.                  | **07** |
| **Q.2** | **(a)** | Enlist different control methods for $SO_2$ using activated carbon and explain any one.                         | **03** |
|        | **(b)** | Discuss control methods for $SO_2$ using metal oxides.                                                          | **04** |
|        | **(c)** | A baghouse has been used to clean a particulate gas steam for nearly 30 years. There are 953 bags of 3.5-in radius and 20 ft high bags in the unit and 99,000 acfm of dirty gas at 250 °F enters the baghouse with a loading of 6.12 gr/ft$^3$. The outlet loading is 0.08 gr/ft$^3$. Governmental regulations state that the outlet loading should not exceed 0.56 gr/ft$^3$. If the system operates at a pressure drop of 8.0 in $H_2O$, how many bags can fail before the unit is out of compliance? Also suggest which fabric material will be suitable to withstand this temperature? | **07** |

**OR**

|        |     |                                                                                                                    | MARKS |
|--------|-----|--------------------------------------------------------------------------------------------------------------------|-------|
|        | **(c)** | A horizontal parallel-plate ESP consists of a single-duct 35ft high and 18ft deep with a 10-inch plate-to-plate spacing. A collection efficiency of 93.1% is obtained with a flow rate of 3800 acfm. The inlet loading is 5.12gr/ft$^3$. Calculate the following: | **07** |

    I.    What value of $\phi$ will yield an efficiency of 99.8%?
    II.   What will the efficiency be if the collection area doubles, while the drift velocity and the volume rate of flow remain the same?
    III.  What will the efficiency be if the drift velocity doubles, while the collection area and the volume rate of flow remain the same?
    IV.  What will the efficiency be if the volume rate of flow doubles, while the drift velocity and the collection area remain the same?

Give a conclusion for each scenario.

| Q.3 | (a) | Write a short note on control of $NH_3$. | 03 |
| | (b) | Write an introductory note on AERMOD. Also mention its applications. | 04 |
| | (c) | A mono dispersed aerosol 1.099 μm in diameter passes through a gravity settler 30 cm wide, 70cm long with 20 plates and channel thickness of 0.24cm. The gas flow rate is 8.6 L/min, and it is observed that it operates at an efficiency of 65.8%. How many plates would be required to have the unit operate at 85% efficiency? | 07 |

**OR**

| Q.3 | (a) | Write a short note on control of $H_2S$. | 03 |
| | (b) | Write an introductory note on CALINE4. Also mention its applications. | 04 |
| | (c) | A cyclone currently operates with an efficiency of 82%. Assuming that the flow rate is increased by 40%, estimate a revised efficiency. | 07 |

| Q.4 | (a) | Discuss working of catalytic converter. | 03 |
| | (b) | Discuss about control of carbon mono oxide (CO) from stationary sources. | 04 |
| | (c) | Discuss in detail the concept and application of dispersion modelling? | 07 |

**OR**

| Q.4 | (a) | Discuss importance of A/F ratio in fuel combustion. | 03 |
| | (b) | Discuss about control of Hydrocarbon (HC) Control from stationary sources. | 04 |
| | (c) | What do you understand by Photochemical Modeling and Receptor Modeling? Explain in detail. | 07 |

| Q.5 | (a) | Enlist operational modification methods for control of oxides of Nitrogen. Discuss in brief. | 03 |
| | (b) | Explain working principle of Cyclone Separator. | 04 |
| | (c) | Discuss in detail desulphurization processes for coal and oil. | 07 |

**OR**

| Q.5 | (a) | Discus Chemico process in brief for control of $SO_2$. | 03 |
| | (b) | Explain working principle of Electrostatic precipitator. | 04 |
| | (c) | Discuss various methods for control of nitrogen oxides in flue gas treatment. | 07 |

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