

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Environmental Pollution Control (CHE F411)

Mid Semester Test

Maximum Marks - 60

Part - A (Closed Book)

1. What is the difference between primary and secondary air pollutants. Give two examples from each category [2]
2. An air quality monitoring station measures the amount of SO₂ in air as 35 ppm at 25⁰C and 1 atm pressure. Convert this concentration to µg/m³. [3]
3. Explain the Non-dispersive infrared (NDIR) technique for measurement of carbon monoxide concentration in atmosphere. [3]
4. What are the various activities affecting the dissolved oxygen content in river water? [2]
5. Describe the technique for determination of total organic carbon in waste water. [3]
6. Determine the number of bags required for a gas flow rate of 25 m³/s, if each bag is 15 cm in diameter and 10 m in length and one-fourth of the bags are offline. Take an air to cloth ratio of 0.01 m/s. [2]
7. Draw a schematic diagram of a sampling train in case of stack sampling. Distinguish between isokinetic, subisokinetic and superisokinetic sampling. [3]

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Environmental Pollution Control (CHE F411)

Mid Semester Test

Part - B (Open Book)

1. A 100 MW coal fired thermal power plant uses coal having a heating value of 20000 kJ/kg and sulphur content of 1%. The overall conversion efficiency (combining the combustion, boiler, steam cycle and turbine efficiency) is 34% and the plant uses 20% excess air. The flue gas at 322⁰C, comes out at a velocity of 12 m/s from a stack of height 75m and diameter 1.5 m. If this power plant is located 2 km far from your place (urban area) what will be the SO₂ concentration in air at your place on a clear summer afternoon. Assume that the wind velocity is in the direction of the power plant to your house. The wind velocity at 10m is 2.2 m/s and the atmospheric temperature and pressure are 25⁰C and 1 atm respectively. [20]
2. Determine the venturi throat area required to achieve 99.5% removal of 1 micron particles having density of 1400 kg/m³ for the following gas stream and venturi characteristics [14]
gas flow rate - 10 m³/s, gas temperature 180⁰C
droplet diameter - 100 μm, liquid flow rate - 0.15m³/s, κ - 200
3. Calculate the overall collection efficiency of a plate type electro static precipitator containing three ducts if one duct is fed 50% of the gas and the other passages 25% each. [8]

Data

Volumetric flow rate of contaminated gas = 2m³/s

Operating temperature and pressure = 200⁰C and 1 atm

Drift velocity = 0.12 m/s

Plate size = 4m×4m

Plate to plate spacing = 0.2m