CLASS: BE   SEMESTER: VII
BRANCH: CHEMICAL ENGG/ CHEMICAL P&P   SESSION : MO/2019

SUBJECT : CL7031 POLLUTION CONTROL EQUIPMENT DESIGN

TIME: 1.5 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Explain the origin of environmental constitution of India.   [2]
    (b) The maximum one hour CO levels in Kolkata reach 35 ppm. Calculate equivalent   [3]
         concentration in terms of mass fraction (ω_p), and in mg/m^3 at standard conditions.

Q2 (a) Explain the procedure of stack sampling for circular and rectangular stack? How   [2]
         isokinetic conditions affect the results.
    (b) Explain the working principle of coulometric analyser for the detection of sulphur oxides   [3]
         in the ambient air with suitable reactions.

Q3   A multi-tray settling chamber having 8 trays, including the bottom surface, handles 6   [5]
         m^3/s of air at 20°C. The trays are spaced 0.25 m apart and the chamber used to be 1 m
         wide and 4 m long. What is the minimum particle size of density 2000 kg/m^3 that can be
         collected with 100% efficiency? What will be the efficiency of settling chamber if 50μm
         particles are to be removed? Laminar flow conditions within the chamber and presence
         of no dust initially on trays may be assumed? Is the laminar flow assumption is justified?
         If not what is the collection efficiency for 56 (v_t = 0.188m/s) and 50 (v_t = 0.15 m/s)
         micron particles.

Q4   A plate type electrostatic precipitator for use in a cement plant for removing dust   [5]
         particles consists of 10 equal channel. The spacing between the plates is 0.15m, and the
         plates are 2m high and 2m long. The unit handles 10,000m^3/hr of gas. What is the
         efficiency of collection? What should be the length of the plates for achieving 99%
         collection efficiency if the other conditions are same.

Q5 (a) Briefly explain the effect of modification of operating conditions on NO$_x$ formation during   [2]
         the combustion process.
    (b) Explain the method of double contact, double absorption (DCDA) process to remove the   [3]
         SO$_x$ from the industrial effluents.

Q6 (a) What is the significance of minimum liquid flow rate of solvent in absorption column   [2]
         explain briefly?
    (b) 1000 m^3/hr of a gas mixture containing 10 mole % of solute and rest inert enters the   [3]
         absorber at 300K temperature and 106.658 kPa. 90% of the original solute is removed.
         Solute free water used for absorption contains 5 mol % solute when it leaves the tower
         at the bottom. Calculate the solvent flow rate to tower.