BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH/PRE-PHD **SEMESTER : II**
BRANCH: ENV. SC. & ENGG. **SESSION : SP/19**

SUBJECT : CE533 AIR POLLUTION CONTROL TECHNOLOGY

TIME: 3.00 Hrs. **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) How Does an Emissions Inventory Contribute to the Air Quality Management Process? How are Emissions Inventories Developed? [5]

Q.1(b) Explain effects of criteria air pollutants on biotic components. [5]

Q.2(a) Explain the technique employed to sample particulate laden gas streams from stack? [5]

Q.2(b) Select air quality description on the basis of PSI (Table 7.3), should be reported for the air pollution on the days given? [5]

Pollutant	Day 1	Day 2	Day 3
O3, 1 hr (ppm)	0.15	0.18	0.12
CO, 8 hr,(ppm)	12	9	14
PM10, 24 hr (microg/m3)	150	350	90
SO2, 24 hr (ppm)	0.12	0.28	0.14
NO2 , 1 hr (ppm)	0.4	0.3	0.5

Q.3(a) A 1000 MW power plant burns 10,000 metric tons of 1.5% sulphur coal per day. The flue gases are emitted into the atmosphere through a stack whose height is 200 m. the diameter of the stack at plume exit is 5 m. the velocity and the temperature of the plume at the exit are 10 m/s and 120 ˚C respectively. Determine the downwind SO_2 concentration in the plume centerline on the ground at a distance of 5 km on a thin overcast night when the environmental lapse rate is equal to zero? Assume that the ambient air temperature is 15 ˚C and the wind speed at the stack altitude is 6 m/s. [refer table 7.7, 7.8, 7.9] [5]

Q.3(b) An urban region can be thought of as composed of a multitude of point sources that fit into a box. If the one side of the box is 30 km and its height is 200 m. determine the steady state CO concentration when the emission rate is 10,000 tons/day and the average wind speed is 3 m/s.? Assume suitable conditions as required. [5]

Q.4(a) An air stream containing particulate matter of density 1500 kg/m3 enters a cyclone flow at a volumetric flow rate of 3.0 m3/s. the dimension of the cyclone are r1= 0.2 m, r2= 0.4 m and w= 0.5 m. determine the angle θ1 that the flow must turn in the cyclone, if the efficiency is to be unity for 60 μm particles. The viscosity of air μ_g= 1.84 x 10-5 kg/m-s. Also plot the efficiency as a function of particle diameter for this angle θ1 (Fig. 1). [5]

Q.4(b) A cylindrical precipitator having a diameter of 1.0 m and 6.0 m long handles dust particles of 2.5 micron in standard air. The volumetric flow rate of air is 0.2 m^3/s. for an electric field strength of 150,000 v/m and q_p = 1.0 x 10^{-15} coulomb, determine the collection efficiency of the precipitator. [Cunningham correction factor $C = 1 + \frac{2\lambda}{d_p}(1.257 + 0.4e^{-0.55\ p/\lambda}$ for standard air, λ = 0.066 μm. μ_g =1.84 x 10^{-5} kg/m-s]. [5]

Q.5(a) Explain effect of air-to fuel ratio emissions, power and fuel economy. [5]

Q.5(b) Compare Bharat stages for vehicular emissions. [5]

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