KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

JUL 14 2017

Level : B. Tech.
Year : IV
Time : 2 hrs. 30 mins.

Course : ENVE 433
Semester : I
F. M. : 55

SECTION "B"

Answer *ALL* the questions. The data or information not given in the questions should be assumed properly.

1. What are the linkages between the source, emission, transport, and receptors of air pollution? Explain with an example. [6]

2. The concentration of PM_{10} in a polluted city is 248 $\mu g/m^3$ and each human breath takes in about one liter of air.
   a. Calculate the mass of PM_{10} in each breath. [3]
   b. If the particles have a diameter of 3 micrometers, calculate the number of particles in each breath. [2]
   c. What kind of air pollution standards can you use for the city? [2]

3. How can you apply the philosophies of air pollution control in a valley such as Kathmandu? Explain with example of major air pollutants in Kathmandu Valley. [5]

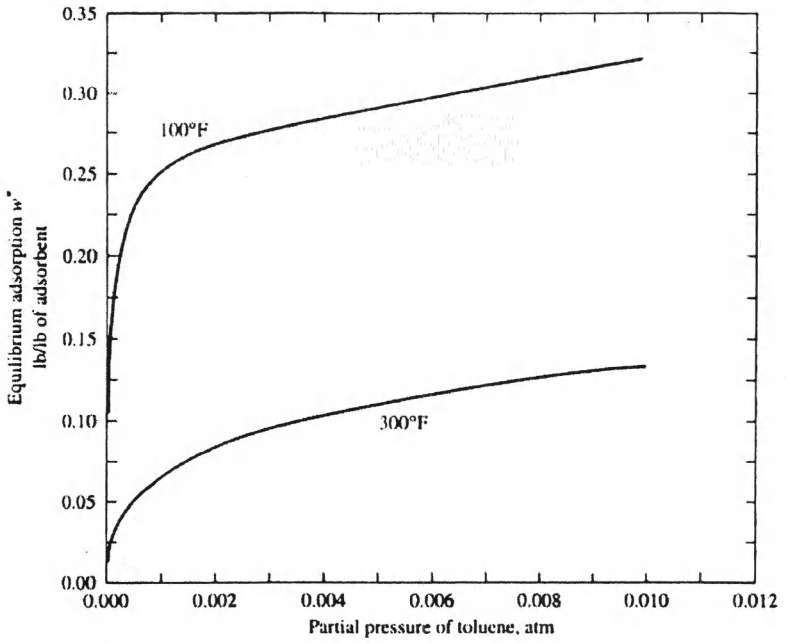
4. A student went to sample the emission coming from a brick kiln stack. She used probes to measure pollutant emission at four points with same cross-sectional area. At those four points, the velocities were measured to be 5, 8, 7, 12 m/s respectively and the corresponding pollutant concentrations were found to be 500, 205, 455, 340 mg/m^3 respectively. Estimate the average concentration of the pollutant in the stack. [4]

5. a) Explain the important of emission factors in air pollution measurement. [3]
   b) What is the benefit of using penetration instead of collection efficiency for designing the air pollution control devices? [2]

6. The PM pollution in a park was estimated to contain spherical particles with diameter of 0.32 μm.
   a) If Stokes' law is applied, then what will be the falling speed of the particles? Take the viscosity of the fluid as 1.8×10^{-5} kg/ms. [3]
   b) If Cunningham correction factor is applicable, then what will be the falling speed of the particle? [2]

7. In a typical cyclone device, Stoke's law is applied to design its fabrication.
   a) How do you calculate the efficiency of the cyclone using block flow assumptions? [3]
   b) How do you calculate the efficiency of the cyclone using mixed flow assumptions? [2]
   c) What range of particles can be separated efficiently by typical cyclones? [1]

8. A polluted flow of air, flowing at a rate of 1350 scfm at 100°F and 1 atm, has toluene having 0.003 mol fraction. An adsorbent device was used to separate toluene. If 1 scf equals 2.595×10^{-3} lbmol, the molecular weight of toluene is 92, and the device operates for 8 hours between regenerations, how many pounds of activated carbon are required for single use of the adsorbent? [5]



9. Using a labeled diagram, explain a process to control sulfur dioxide in industries. [6]

10. How are the thermal NO produced? Explain the mechanism. [6]