

28.5.07
EJ

B.E. (Civil) Part IV 8th Semester Examination May, 2007

Industrial Pollution and Control (Elective II)

CE 804/6

Full Marks: 100

Time allowed : 3 Hours

1st HALF

Answer Question No. 1 and any 2 (two) from the rest.

1. Name different meteorological factors affecting the air pollution. Develop the relationship between 'temperature and altitude' and 'pressure and altitude'.

(2+8=10)

2.(a) Comment on various 'stability' conditions of the atmosphere with an explanatory sketch. Which condition is most favorable for the dispersion of air pollutants? How does the wind velocity vary with altitude? Briefly explain 'coning' and 'fumigation'.

(4+1+2+3=10)

(b) What do you understand by "Dispersion Modeling"? Write a well-known 'dispersion model' mentioning the identity of various parameters. Define 'Maximum Mixing Depth (MMD)'. Also highlight on the way of its determination.

(2+3+2+3=10)

3. (a) A coal-burning power plant burns 5.85 tones of coal per hour and discharges combustion products through a stack with an effective height of 75 m. The coal has a sulfur content of 4.5% and the wind velocity at the top of the stack is 9.0 m/sec. Atmospheric condition is close to neutral. Determine the maximum ground level concentration of SO₂ and the distance from the stack at which maximum occurs. [$\sigma_y = 68 \cdot x^{0.894}$ and $\sigma_z = 33.2 \cdot x^{0.725}$, where, x = Downwind Distance in Km.]

(10)

(b) Write the considerations to be taken for stack design. How can you find out the effective stack height? Comment on the influence of atmospheric stability on the effective stack height.

(4+4+2=10)

4. (a) name various devices that can be used for the control of particulate emission. Briefly highlight on the applicability, advantages and disadvantages of any two of such devices. Which devices would be effective for particulate control in 'Iron and Steel' industry?

(3+5+2=10)

(b) State the role of 'Adsorption' and 'Absorption' in the control of gaseous pollutants. Name various absorption units and comment on their applicability. What do you understand by 'Direct Flame Combustion', "Thermal Combustion' and "Catalytic Combustion" of the air pollutants.

(3+4+3 = 10)

2nd HALF

Answer Question No. 5 and any 4 (four) from the rest

5. Write the general characteristics exhibited by a hazardous waste. How can you approach for managing the hazardous waste on the basis of logical priority? Name various technologies available for hazardous waste treatment.

(4+3+3=10)

6. Write short notes on

- a. Composite sample and Grab sample
- b. Vegetable tanning and Chrome tanning
- c. Equalization and Neutralization
- d. BOD and COD

(10)

7. Mention the operations carried out in Beam House. Give the wastewater characteristics and the probable treatment methodologies of the wastewater that generates in Beam House operations. With a neat sketch show the process flow-sheet of chrome tanning. Discuss the water pollution potential of tannery waste.

(2+2+4+2 = 10)

8. From following column analysis data calculate the % solid removal if the suspension is discrete. Sampling depth=4ft, Clarification rate=0.08ft³/ft²/sec

Sampling Time(min):	0	0.5	1.0	2.0	4.0	6.0	8.0
Fraction remaining (C/C ₀):	1.0	0.56	0.48	0.37	0.19	0.05	0.02

(10)

9. Discuss different mode of flocculation. Define zeta potential and pH_{pzc}. Mention different processes of heavy metal removal from industrial wastewater. What pH level at a monitoring station should be maintain in a tannery industry to restrict the effluent chromium level at 0.01mg/l. K_{sp}=6×10⁻³¹

(4+2+2+2=10)

10. At a monitoring station the following data were obtained.

Time interval(hr.)	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
Flow rate (L/min)	20	30	35	50	55	70	75	80	60	50	30	20
BOD(mg/l)	300	350	400	300	250	200	150	100	80	70	65	55

Calculate:

- (i) The volume fraction to be collected from each time interval to prepare a 10 litres of composite sample.
- (ii). The average concentration of the sample.

(6+4= 10)