



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(CHE)/SEM-8/CHE-803/2013

2013

ENVIRONMENTAL ENGINEERING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following questions : $10 \times 1 = 10$

- i) Polluted water having low BOD are most economically treated in
- a) Sedimentation tank
 - b) Oxidation pond
 - c) Sludge digester
 - d) Clarifier.



- ii) Grab sample is obtained
 - a) only the prevailing conditions at the time of sampling
 - b) average conditions of sampling
 - c) by collecting individual samples at frequent intervals
 - d) all of these.
- iii) In reaeration, the solubility of oxygen in fresh water at saturation point
 - a) increases with an increase in temperature
 - b) increases with decrease in temperature
 - c) decreases with an increase in temperature
 - d) decreases with decrease in temperature.
- iv) SVI means
 - a) Solid Volume Index b) Sludge Volume Index
 - c) Sludge Volatile Index d) Solid Volatile Index.
- v) Landfill leachate is
 - a) An inorganic solvent
 - b) Highly concentrated inorganic pollutant
 - c) Landfill water sources
 - d) Low concentrated inorganic pollutant.



vi) The theme of World Environment Day, 2013 is related to

- a) Green economy b) reduce food-print
- c) Climate change d) Forest.

vii) In tertiary treatment of waste water Polyaluminum chloride is used

- a) to reduce sludge volume
- b) to increase sludge volume
- c) to disinfect water
- d) to reduce BOD.

viii) Which one of the following is an asphyxiant ?

- a) Benzene b) CO
- c) Mercury d) PAN.

ix) In an aerosol

- a) some of the particles may be positively charged
- b) some of the particles may be negatively charged
- c) some of the particles may be uncharged
- d) all of these.



- x) The chemical most commonly used to speed sedimentation of sewage is
- a) sulphuric acid
 - b) copper sulphate
 - c) lime
 - d) sodium permanganate.
- xi) High absolute humidity
- a) increases the explosibility of the aerosol
 - b) decreases the explosibility of the aerosol
 - c) does not change the explosibility of the aerosol
 - d) none of these.
- xii) Which of the following nitrogen oxides is neutral in character ?
- a) N_2O_4
 - b) N_2O_5
 - c) N_2O
 - d) N_2O_3 .

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Deduce the equation of temperature-lapse rate for polytrophic model and the profile of temperature altitude of the atmosphere.



3. Why is CO one of the most toxic gaseous substances for human health ? Explain.
4. Describe the method of Grab sampling and composite sampling for waste water analysis. What are the steps undertaken in collecting water sampling ? 3 + 2
5. Discuss the methodology of conducting a 5 day BOD test.
6. What do you mean by solidification and stabilization of hazardous wastes ? What are the several disposal methods in landfill ? 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Differentiate between the operating principle of activated sludge system and trickling filters. 5
- b) A completely mixed activated sludge process is to be used to treat a waste water flow of $500 \text{ m}^3/\text{hr}$ having a soluble BOD_5 of 250 mg/L . The concentration of soluble BOD_5 escaping treatment is 10 mg/L , design data are : $X = 2000 \text{ mg/L}$ as MLVSS; $Y = 0.5$; $k = 5 \text{ day}^{-1}$; $k_d = 0.06 \text{ day}^{-1}$; $k_s = 100 \text{ mg/L}$. Determine the following :
 - (i) Treatment efficiency of the process
 - (ii) Mean cell residence time
 - (iii) Hydraulic residence time
 - (iv) Volume of aeration tank. 10



8. a) Define oxygen sag curve.
- b) What are the several techniques used for recovery of materials from process effluents ?
- c) Describe in detail the treatment methodology of lagoons.

3 + 5 + 7

9. a) Compare sanitary land filling, incineration and open dumping in case of solid waste disposal in a crowded city.
- b) Write a short note on Composting.
10. a) Write comprehensive note on any one of the following environmental legislations :

9 + 6

- (i) Water (Prevention and Control of Pollution) Act, 1974
- (ii) Air (Prevention and Control of Pollution) Act, 1981.

- b) A factory uses 2,00,000 litres of furnace oil (specific density 0.97) per month. If for one million litres of oil used per year, the particulate matter emitted is 3.0 tonnes per year, SO_2 emitted is 59.7 tonnes per year, NO_x emitted is 7.5 tonnes per year, hydrocarbons emitted are 0.37 tonnes per year, and carbon monoxide is 0.52 tonnes per year, calculate the height of the chimney required to be provided for safe dispersion of the pollutants.

7 + 8



11. Write short notes on any *three* of the following : 3 × 5

- a) Treatment of liquid waste from tannery
- b) Environmental management in pulp and paper industry
- c) Adiabatic Lapse Rate
- d) Air Pollutants Norms
- e) Trickling Filter
- f) Chemical Treatment of Waste Water.
