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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.

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- 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 Enviro	nmen	t Day, 2013 is related t	9
	a)	Green economy	b)	reduce food-print	
	c)	Climate change	d)	Forest.	
vii)		tertiary treatment of	wast	e water Polyaluminui	n
	a)	to reduce sludge volu	me		
	b)	to increase sludge vol	lume		
	c)	to disinfect water			
	d)	to reduce BOD.			
viii)	Wh	Thich one of the following is an asphyxiant?			
	a)	Benzene	b)	СО	
	c)	Mercury	d)	PAN.	
ix)	In a	n aerosol			
	a)	some of the particles	may b	oe positively charged	
	b)	some of the particles	may b	oe negatively charged	
	c)	some of the particles may be uncharged			
	d)	all of these.			
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- The chemical most commonly sedimentation of sewage is
- sulphuric acid a)
- b) copper sulphate
- c) lime

X)

- d) sodium permanganate.
- High absolute humidity xi)
 - a) increases the explosibility of the aerosol
 - decreases the explosibility of the aerosol b)
 - does not change the explosibility of the aerosol c)
 - d) none of these.
- xii) Which of the following nitrogen oxides is neutral in character?
 - N_2O_4 a)

 N_2O c)

d) N₂O₃.

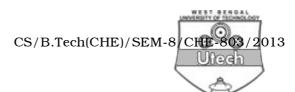
GROUP - B

(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 under taken 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?

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- 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 m 3 /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 mg/L as MLVSS; Y = 0.5; k = 5 day $^{-1}$; $k_d = 0.06$ day $^{-1}$; $k_s = 100$ 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.

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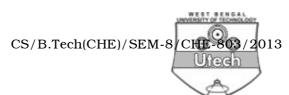
- 8. a) Define oxygen sag curve.
 - b) What are the several techniques used for recovery of materials from process effluents?
 - c) Describe in detail the treatment methodology of lagoons.

3 + 5 + 7

- 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.

9 + 6

- 10. a) Write comprehensive note on any one of the following environmental legislations:
 - (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.



11. Write short notes on any three of the following:

- 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.

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