

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

1. Write briefly:

- a) What are the salts that cause permanent hardness in water?
- b) What is biodegradability index of a sample?
- c) What is Streeter Phelp's equation for determining DO deficit?
- d) What is head loss?
- e) How can we calculate efficiency of a trickling bed filter?
- f) What is hydraulic retention time and solid retention time?
- g) What are green house gases?
- h) What is bioaugmentation?
- i) What is incineration?
- j) Name few microorganisms help in desulfurization of coal.

(10×1)

SECTION-A

2. a) Write the advantage and limitations of BOD and COD. Derive an expression for first stage BOD exertion.

b) A wastewater of $5.0 \text{ m}^3/\text{sec}$ is discharged into a river of flow $50 \text{ m}^3/\text{sec}$. The ultimate BOD of wastewater is 200 mg/l and DO is 1.5 mg/l . The river water has a BOD of 3 mg/l and DO of 7 mg/l . The reaeration coefficient of the river water is $0.2/\text{day}$ and BOD decay coefficient is $0.4/\text{day}$. The river has a cross-sectional area of 200 m^2 and the saturated DO concentration of the river water is 8 mg/l .

(i) At a downstream point of 10 km calculate the DO of the mixture.

(ii) At which point the DO is a bare minimum?

(3,3,4)

3. a) What are the factors that affect microbial bioremediation? Explain the advantages and disadvantages of bioremediation process.

b) Write short notes,

i) Preliminary waste water treatment

ii) Design criteria of sedimentation tank.

(5, 2.5, 2.5)

4. a) What are the design considerations of UASB? Explain with diagram. How will you calculate total height of the reactor in UASB?

b) Differentiate between aerobic attached growth process and aerobic suspended growth process.

(5,5)

P.T.O.

SECTION-B

5. a) What are the unit operations and unit processes that are followed during sludge treatment?
- b) Write short notes on management and safety of handling hazardous waste. (5,5)
6. a) What are the mechanisms of microbially enhanced oil recovery?
- b) What is biomineralization? Discuss with specific examples along with chemical reaction? (5, 5)
7. a) Differentiate between DGGE and TGGE.
- b) How do we use nucleic acid hybridization technique for identification and characterization of environmental samples? (5, 5)

x-x-x