

**ENVIRONMENTAL ENGINEERING  
(CHEN 4133)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The theme of World Environment Day 2020 was related to  
(a) Ecosystem Restoration (b) Beat Plastic Pollution  
(c) Air Pollution (d) Desert & Desertification.
- (ii) The host country of World Environment Day 2022 celebration centralized programme would be  
(a) India (b) China (c) Sweden (d) New Zealand.
- (iii) BOD<sub>5</sub> at 20<sup>o</sup>C is same as BOD<sub>3</sub> at X<sup>o</sup>C, where value of X is  
(a) 0 (b) 31 (c) 10 (d) 50.
- (iv) Which of the following is not a primary air pollutant?  
(a) Dust (b) SPM (c) PAN (d) SO<sub>x</sub>.
- (v) Minamata disaster was an example of  
(a) Bisphenol-A pollution (b) Lead Pollution  
(c) Mercury Pollution (d) Radio-active Pollution.
- (vi) The principle of terminal settling velocity is utilized in  
(a) Bag house (b) Cyclone Separator  
(c) Do meter (d) Venturi Meter.
- (vii) A permit which allows a country to produce a certain amount of carbon emissions and which can be traded if the full allowance is not used is known as  
(a) Carbon Footprint (b) Carbon Flip Bond  
(c) Carbon Credit (d) None of the above.
- (viii) Identify the least efficient treatment process  
(a) Activated Sludge process (b) Extended Aeration System  
(c) Trickling Filter (d) Anaerobic Fixed Film Reactor.
- (ix) ISO 18000 series is related to Certification of \_\_\_\_\_ Standard.  
(a) Occupational health & safety (b) Environmental management  
(c) Quality Management (d) Design of Environment Protection Equipments

- (x) The Root-zone/Reed Bed Treatment uses
- |           |                         |
|-----------|-------------------------|
| (a) Neem  | (b) Zoo Plankton        |
| (c) Babul | (d) Typha elephantiana. |

**Group- B**

2. (a) State Air Act 1981 its explain its importance. [(CO1)(Remember/LOCQ)]  
(b) A factory uses 2,50,000 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<sub>2</sub> emitted is 59.7 tonnes per year, NO<sub>x</sub> 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. [(CO3)(Understand/LOCQ)]  
**6 + 6 = 12**
3. Discuss the principles and working procedure of a Hi-Volume (RSPM) Sampler with a neat sketch. [(CO3)(Remember/LOCQ)]  
**4 + 4 + 4 = 12**

**Group - C**

4. A wastewater contains the following:  
150 mg/l ethylene glycol  
100 mg/l phenol  
40 mg/l sulfide (S<sup>2-</sup>)  
125 mg/l ethylene diamine hydrate (essentially non biodegradable).  
Compute COD and TOC. Compute BOD<sub>5</sub> if the k<sub>10</sub> is 0.2/day.  
After treatment, the BOD<sub>5</sub> is 25 mg/l. Estimate the COD (k<sub>10</sub> = 0.1/day). [(CO3)(Evaluate/HOCQ)]  
**12**
5. A wastewater treatment plant discharges 1.0 m<sup>3</sup>/s of effluent having an ultimate BOD of 40.0 mg/L, into a stream flowing 10.0 m<sup>3</sup>/s. Just upstream from the discharge point, the stream has an ultimate BOD of 2.0 mg/L. The deoxygenation rate coefficient is 0.22/day. Assuming complete and instantaneous mixing, find ultimate BOD of the mixture of waste and river just downstream from the outfall. Assuming a constant cross-sectional area for the stream equal to 55 m<sup>2</sup> what ultimate BOD would you expect to find at a point 10,000 m downstream? [(CO3)(Evaluate/HOCQ)]  
**(6 + 6) = 12**

**Group - D**

6. What is Bio-remediation? Evaluate the Monod kinetics model for remediation involving Chromium pollution. What are its limitations? [(CO2)(Evaluate/HOCQ)]  
**(2 + 8 + 2) = 12**

7. Analyze using a case study, the methodology of Hazardous Waste Management by Electro-chemical Oxidation.

[(CO2)(Analyze/IOCQ)]

12

**Group - E**

8. Delineate a case study on pollution control in a Dairy mentioning:

(i) Target Pollution Loads, (ii) Treatment Technologies and (iii) Key Issues.

[(CO4)(Analyze/IOCQ)]

(3 + 5 + 4) = 12

9. Write Technical notes on:

(i) Ranking of wastewater treatment alternative.

(ii) Environment Management Plan in Tanneries.

[(CO4)(Analyze/IOCQ)]

(6 + 6) = 12

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| Cognition Level         | LOCQ | IOCQ | HOCQ |
|-------------------------|------|------|------|
| Percentage distribution | 25   | 37.5 | 37.5 |

**Course Outcome (CO):**

At the end of the course the students should be able:

1. To apply the knowledge of Legislation concerning Environmental Engineering & Pollution Control prevalent in India.
2. To utilize the knowledge base of Solid Waste Management in order to achieve Swachh Bharat Mission.
3. To solve problems of Air Pollution and Water Pollution in batch and flow system and design suitable instruments/equipments.
4. To design Environmental Management Plan for chemical industries.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

