ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL
(CHE3132)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Biotic component of ecosystem is
(a) Air (b) Water (c) Soil (d) Living being

(ii) In WBPCB region, for Green Category Industry, Consent to Operate is valid for
(a) One year (b) Five years
(c) Seven years (d) Life time of industry

(iii) Which of the following is not a primary air pollutant?
(a) CO (b) NO (c) O_3 (d) SO_2

(iv) Grey Water is also termed as:
(a) Sullage (b) Sewage (c) River water (d) Spring water

(v) Facultative ponds are designed to function with:
(a) Only anaerobic organisms (b) Only aerobic organisms
(c) Both aerobic and anaerobic zones (d) Only algae

(vi) The theme of World Environment Day 2023 celebration was based on:
(a) Air Pollution (b) Land restoration
(c) Desertification (d) Plastic pollution

(vii) Quarting Sampling is used in
(a) Solid Waste Management (b) Air Pollution
(c) Liquid Waste Management (d) Toxicity Management

(viii) Biomedical waste sharps (like needles, blades) are disposed in which colour-coded container?
(a) Blue (b) Red (c) Yellow (d) White (translucent)

(ix) Identify the category of Industry, the effluent of which has highest BOD level
(a) Sulphuric Acid plant (b) Electrochemical Industry
(c) Dairy (d) Petroleum Refinery

(x) The United Nations Environment Programme (UNEP) head quarter is in
(a) Geneva (b) Nairobi (c) Beijing (d) New York

Fill in the blanks with the correct word

(xi) Abiotic environment includes ……., temperature, precipitation.

(xii) …… is an example of bio-degradable waste.

(xiii) The TLV for ..... level is 65 db.

(xiv) The ..... Filter is not a viable option for temparate countries.

(xv) Smog is ……..

Group - B

2. (a) Explain any one cycle of the following
(i) Carbon cycle (ii) Nitrogen Cycle *[(CO1)(Analyse/HOCQ)]*
(b) How the environmental pollution can be prevented and controlled? *[(CO1)(Understand/IOCQ)]*

8 + 4 = 12

3. (a) What is noise dose and explain the same as recommended by Noise Control Board? *[(CO1)(Remember/LOCQ)]*
(b) State the 'Water Act, 1974' and explain its significance. *[(CO1)(Understand/IOCQ)]*
(c) Write short on photochemical smog. *[(CO1)(Remember/LOCQ)]*

2 + 6 + 4 = 12

Group - C

4. Just below the point where a continuous discharge of pollution mixes with a river, the BOD is l10.9 mg/L and DO is 7.6 mg/L. The river and waste mixture has a temperature of 20C, a de-oxygenation constant k_d of 0.20/day, an average flow speed of 0.30 m/s, and an average depth of 3.0 m.
(i) Find the time and distance downstream at which the oxygen deficit is a maximum.
(ii) Find the minimum value of DO. *[(CO3)(Evaluate/HOCQ)]*

(6 + 6) = 12

5. (a) Discuss the principle of a Trickling Filter with a neat sketch. *[(CO3)(Analyse/IOCQ)]*
(b) Design a trickling filter with recirculation using a suitable empirical method for data supplied: Sewage flow= 6000 m^3/day; Raw settled BOD= 210 mg/l; Filter depth D=2.0m; Media= 7.5 –10 cm diameter stones. The efficiency of the filter would be about 85%. *[(CO3)(Evaluate/HOCQ)]*

(3 + 3) + 6 = 12

Group - D

6. (a) Delineate the purification methodology of industrial sludge containing Mercury pollution. *[(CO2)(Analyse/IOCQ)]*
   (b) Suggest a suitable method of disposal of Ferro-Chrome slag. *[(CO2)(Remember/LOCQ)]*

9 + 3 = 12

7. (a) Define Bio-remediation and explain its basic principles. *[(CO2)(Remember/LOCQ)]*
   (b) Evaluate the Monod model for studying Chromium degradation kinetics by bacteria stating its basic assumptions. *[(CO2)(Evaluate/HOCQ)]*

(2 + 2) + 8 = 12

Group - E

8. (a) Explain the salient steps of treatment of Black Liquor in a Pulp and paper industry following
   Kraft Process. *[(CO4)(Analyse/IOCQ)]*
   (b) Evaluate how the treatment methods vary in case of Red (Sulphite) Liquor. *[(CO4)(Evaluate/HOCQ)]*

7 + 5 = 12

9. (a) You are to develop an engineering package of wastewater treatment for a Zoological garden.
   Show your sequence of activities following the methodology of Ranking of wastewater treatment alternative. *[(CO4)(Evaluate/HOCQ)]*
   (b) For developing such package, some Process variables scores are added, while some of those are subtracted. – Explain with reasons. *[(CO4)(Analyse/IOCQ)]*

8 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	13.54	37.50	48.96