ECOLOGY AND ENVIRONMENTAL ENGINEERING
(MECH 4130)

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) Biosphere consists of [(CO1) (Remember/LOCQ)]
(a) land (b) water (c) air (d) all of these.

(ii) Noise level standard to be maintained in Commercial areas is [(CO5) (Remember/LOCQ)]
(a) 50 dB (b) 75 dB (c) 70 dB (d) 100 dB.

(iii) Basic devices that are used in coal based thermal power station are [(CO1) (Understand/LOCQ)]
(a) boiler (b) turbine (c) condenser (d) all of these.

(iv) TDS with reference to water quality means [(CO2) (Remember/LOCQ)]
(a) tertiary dissolved solids (b) total dissolved solids
(c) temporary dispersed solids (d) tax deduction at source.

(v) Accumulation rate of energy in a control volume [(CO4) (Analyse/IOCQ)]
(a) Input rate + output rate + reaction rate
(b) Input rate – output rate – reaction rate
(c) Input rate – Output rate+ reaction rate
(d) Input rate –Output rate –reaction rate.

(vi) Carbon emissions are functions of [(CO3) (Analyse/IOCQ)]
(a) population (b) GDP/person
(c) energy/GDP (d) all of these.

(vii) Primary pollutants in air are [(CO1) (Remember/LOCQ)]
(a) CO_2 (b) SO_X (c) NO_X (d) all of these.

(viii) ISO 14000, developed by International Organisation for Standardisation, is a [(CO3) (Understand/LOCQ)]
(a) Quality System Standard

(b) Environmental Management System Standard
(c) Safety Management System Standard
(d) Automotive Industry Standard

(ix) SOC,VOC, TDS are the terms associated with quality of [(CO4) (Understand/LOCQ)]
(a) air (b) swerage (c) water (d) contaminants.

(x) Safe level of TDS in drinking water as per BIS is [(CO4) (Understand/LOCQ)]
(a) 200 ppm (b) 300 ppm (c) 500 ppm (d) 400 ppm.

Group – B

2. (a) Define Ecology. What does an ecologist do? What is an ecosystem? How is ecological balance disturbed due to human activities? [(CO1) (Remember/LOCQ)]

(b) Show that if a quantity may be expressed as a product of factors each growing exponentially, then the total rate of growth of that quantity is the sum of individual growth rates. [(CO1) (Understand/LOCQ)]

(1 + 1 + 1 + 3) + 6 = 12

3. (a) A coal fired power plant converts one-third of the coal's energy into electrical energy. The electrical power output of the plant is 1000 MW. The other two-thirds of the energy content of the fuel is rejected to the environment as waste heat. About 15% of the waste heat goes up the smokestack and the rest 85 % is taken away by cooling water that is drawn from the nearby river. The river has an upstream flow of 100 m^3/s and a temperature of 20^0C.
(i) If the cooling water is allowed only to rise in temperature by 10^0C, what flow rate of the stream would be required ?
(ii) What would be the river temperature just after it receives the heated cooling water? [(CO3) (Evaluate/HOCQ)]

(b) What is Environment Impact Assessment (EIA)? Why is EIA necessary? What are the benefits of EIA? What is the outcome of an EIA? [(CO3) (Analyse/IOCQ)]

6 + (1 + 1 + 3 + 1) = 12

Group – C

4. (a) Draw the schematic diagram of a coal based thermal power plant and explain how the particulate matter and the various gaseous pollutants are released into the atmosphere. [(CO4) (Analyze/IOCQ)]

(b) Find the diameter of of the particles that will be removed from a settling chamber, given that,
settling velocity, V= 0.33m/s
viscosity = $2.0x10^{-5}$ kg/m.s
sp. gr. of the particle = 2.0
Settling chamber length = 8 m
Chamber height = 2 m
density of particles = $2000kg/m^3$
[(CO4) (Analyze/IOCQ)]

6 + 6 = 12

5. (a) Write short notes on
(i) ODP (ii) GWP. [(CO4) (Understand/LOCQ)]
(b) What is green house effect? Name few green house gases, their sources of origin and how the green house gases impact the Global Warming.
[(CO4) (Understand/LOCQ)]

6 + 6 = 12

Group – D

6. (a) What are the requirements water must satisfy in order to be accepted as drinking water. State the drinking water standard prescribed by WHO.
[(CO4) (Remember/LOCQ)]
(b) What is biochemical oxygen demand? Explain how aerobic and anaerobic decomposition of a biodegradable organic matter takes place and the resulting gases released in the atmosphere. [(CO4) (Analyze/IOCQ)]

6 + 6 = 12

7. (a) A test bottle containing just seeded dilution water has its DO level drop by 1.0 mg/L in a five day test. A 300mL BOD bottle filled with 15 mL of waste water and the rest seeded dilution experiences a drop of 7.2 mg/L in the same time period. What would be the 5 day BOD of the waste? [(CO4) (Evaluate/HOCQ)]
(b) What are the ill effects of sound pollution? How is sound level measured?
[(CO5) (Remember/LOCQ)]

6 + (2 + 4) = 12

Group – E

8. (a) Briefly explain how human exposure assessment is done when exposed to a toxic environment. [(CO6) (Analyse/IOCQ)]
(b) Estimate the lifetime cancer risk from fish taken from waters containing concentration of triglycerides equal to 100 ppb (0.1mg/L). Given bio concentration factor for trichloroethylene (TCE) 10.6L/kg.
[(CO6) (Evaluate/HOCQ)]

6 + 6 = 12

9. (a) What is EMS audit ? What are the steps involved in implementing ISO 14000 in an organisation. [(CO2) (Remember/LOCQ)]
(b) What are hazardous substances? Name a few hazardous substances which are responsible for climatic change across the world. [(CO2) (Understand/LOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	52.83%	30.19 %	16.98 %

Course Outcome (CO):
After the completion of the course students will be able to

CO 1 Identify the current and emerging environmental engineering issues
CO 2 Learn ethical and societal responsibilities and to act accordingly
CO 3 Assess the impact of human activities on the environment
CO 4 Interpret the various types of pollutants and its probable remedies
CO 5 Formulate and construct solutions to minimize and mitigate environmental impacts
CO 6 Analyze and practice the profession of environmental engineering in the public and /or private sector

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

Department & Section	**Submission link:**
AEIE, CSE	https://classroom.google.com/c/NDI4MDIxNDIwOTQ1