

**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) Hydrosphere deals with
(a) land (b) water (c) air (d) all of these.
- (ii) Troposphere stretches upto _____ km above earth's surface.
(a) 5 (b) 15 (c) 7 (d) 10.
- (iii) Lithosphere deals with
(a) land (b) water (c) air (d) all of these.
- (iv) TDS with reference to water quality means
(a) tertiary dissolved solids (b) total dissolved solids
(c) temporary dispersed solids (d) temporary dissolved solids.
- (v) Temperature of air at an altitude of 4000 m above earth when ambient temperature is 26^o C, is
(a) 39^oC (b) 0^oC (c) 13^oC (d) 0^o F.
- (vi) Most important greenhouse gas is
(a) CO₂ (b) CO (c) water vapour (d) SO₂.
- (vii) Carbon emission is functions of
(a) population (b) affluence (c) technology (d) all of these.
- (viii) ISO 14001 deals in
(a) QMS (b) EMS (c) TQM (d) TPM.
- (ix) Most important compound responsible for ozone depletion is
(a) chlorofluorocarbons (b) CO₂
(c) fly ash (d) asbestos.
- (x) Absence of ozone layer causes
(a) skin cancer (b) photochemical smog
(c) increase temperature of earth (d) all of these.

Group - B

2. (a) Define Ecology and Ecosystem. Name biotic and abiotic components of an ecosystem. Briefly describe how autotrophs produce their own food. [[CO1](Remember/LOCQ)]
- (b) In an environmental study, carbon emission was defined as the product of three factors as given below:
 Carbon emissions = (energy/person) × (carbon/energy) × population
 If per capita energy demand increases by 1.5% per year, fossil fuel emissions of carbon/energy increases by 1% and the population increases at 1.3% per year, then,
 (i) How long would it take before we are emitting carbon at twice the current rate?
 (ii) At what point and by what fraction would per capita energy demand have increased?
 (iii) At what point and by what fraction would total energy demand have increased? [[CO1](Analyse/IOCQ)]
(1 + 2 + 3) + 6 = 12
3. (a) It took 300 years for the world's population to increase from 0.5 billion to 4.0 billion. If we assume the exponential growth at a constant rate what that rate would be? If population continues to grow at this rate, after how many years will the population reach 8 billion? [[CO3](Evaluate/HOCQ)]
- (b) What are primary pollutants and secondary pollutants? Name few primary pollutants generated by human activities. With the help of a pie chart, show the amount of primary pollutants present in the air. [[CO4](Remember/LOCQ)]
6 + (1 + 1 + 1 + 3) = 12

Group - C

4. (a) What is acid rain? How does the acid rain form due to various industrial activities? What are the adverse effects of acid rain on environment? [[CO4](Remember/LOCQ)]
- (b) What is green house effect? Name few green house gases, their sources and explain how these gases impact the Global Warming. [[CO4](Analyse/IOCQ)]
(1 + 2 + 3) + (1 + 2 + 3) = 12
5. (a) How does ozone layer protect lives on this planet? Name few refrigerants that are responsible for depletion of ozone layer? What is "Montreal Protocol"? [[CO5](Analyse/IOCQ)]
- (b) As per the Bureau of Indian Standards, what are the permissible limits of SO₂, NO₂ & SPM in residential areas and industrial areas on annual basis and 24 hour basis? What is the function of an electrostatic precipitator in thermal power plants? [[CO6](Remember/LOCQ)]
(2 + 2 + 2) + (4 + 2) = 12

Group - D

6. (a) Name some VOCs and emerging pollutants that contribute to water pollution. What is five day BOD test and how is it carried out in Lab? [[CO4](Remember/LOCQ)]

- (b) What is noise? How is noise measured? What sound power levels results from combining the following three levels: 68 dB, 79 dB, and 75 dB?

[(CO5)(Analyze/IOCQ)]
(2 + 4) + (1 + 2 + 3) = 12

7. (a) Explain the five day unseeded BOD test to assess the requirement of oxygen of a biodegradable organic matter.

[(CO4)(Remember/LOCQ)]

- (b) What are the accepted sound levels in residential areas, schools and hospitals and in commercial areas? What are the preventive and control measures that may be taken for reducing noise pollution?

[(CO5)(Remember/LOCQ)]
6 + (2 + 4) = 12

Group - E

8. (a) Draw the schematic diagram of a typical water treatment plant to bring water to drinking water quality and briefly discuss each steps involved.

[(CO2)(Remember/LOCQ)]

- (b) What is ISO 14001 for environment management system? Who decides the EMS policy of an organisation? When did ISO 14001:2015 version come to existence? What is the role of third party audit in EMS? How are the audit findings are taken care of by an organisation?

[(CO2)(Understand/LOCQ)]
6 + (1 + 1 + 1 + 1 + 2) = 12

9. (a) What is EMS audit? What are the steps involved in implementing ISO 14000 in an organisation.

[(CO2)(Remember/LOCQ)]

- (b) Discuss very briefly the various methods that are adopted for disposal of municipal solid wastes.

[(CO6)(Understand/LOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	68.75	18.75	12.5

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