

ECOLOGY AND ENVIRONMENTAL ENGINEERING
(MECH 4130)

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) Which of the following is an example of abiotic component of an ecosystem?
(a) Plants (b) Animals
(c) Minerals (d) Micro-organisms.
- (ii) In Ecological Pyramid of Energy, the base line of the pyramid represents
(a) Producers (b) Primary consumers
(c) Secondary consumers (d) Tertiary consumers.
- (iii) Which of the following is an extremely short-lived and unstable air pollutant?
(a) NO₂ (b) CO₂ (c) Ozone (d) SO₂.
- (iv) The proportion of oxygen in air (by volume) is
(a) 0.93% (b) 20.95% (c) 78.09% (d) 0.03%
- (v) Away from the surface of the earth towards outer space, the sequence of atmospheric layers are
(a) Troposphere; Mesosphere; Stratosphere; Thermosphere; Exosphere
(b) Troposphere; Stratosphere; Thermosphere; Mesosphere; Exosphere
(c) Troposphere; Stratosphere; Mesosphere; Thermosphere; Exosphere
(d) Troposphere; Thermosphere; Mesosphere; Stratosphere; Exosphere.
- (vi) The cyclone separator/settler type of particulate-control equipment relies on the following field of force to pull down particulates:
(a) Gravitational force (b) Centrifugal force
(c) Magnetostatic force (d) Electric field force.
- (vii) Noise level to be maintained in Commercial areas is
(a) 50dB (b) 70 dB (c) 75 dB (d) 100 dB.
- (viii) Which of the following salts is the main cause of permanent hardness of water?
(a) Magnesium sulphate (b) Magnesium bicarbonate
(c) Magnesium carbonate (d) All of these.

- (ix) TDS with reference to water quality means
 (a) Tertiary Dissolved Solids (b) Total Dissolved Solids
 (c) Temporary Dispersed Solids (d) Temporary Dissolved Solids.
- (x) What does the term "biodegradable" mean?
 (a) Capable of being recycled
 (b) Able to decompose naturally by biological processes
 (c) Non-toxic and harmless to the environment
 (d) Inert and stable in the environment.

Fill in the blanks with the correct word

- (xi) The ozone layer in the stratosphere absorbs a portion of the _____ radiation from the sun.
- (xii) Particulate Matter (PM) typically have aerodynamic diameters less than or equal to _____.
- (xiii) Maximum permissible concentration of nitrates in drinking water is _____ mg/L.
- (xiv) BOD is _____.
- (xv) The primary component responsible for the greenhouse effect is _____.

Group - B

2. (a) Briefly describe the different forms of natural resources with classification. [[CO1](Remember/LOCQ)]
 (b) Evaluate the value of environment in the paradigm of degradation of environment. [[CO3](Evaluate/HOCQ)]
6 + 6 = 12
3. (a) Analyze the problems associated with population growth. [[CO3](Analyze/IOCQ)]
 (b) Briefly describe various forms of pollutants and contaminants in environment. [[CO4](Understand/LOCQ)]
6 + 6 = 12

Group - C

4. (a) What is meant by 'atmospheric stability'? Briefly discuss about the different factors that affect atmospheric stability. [[CO3](Remember/LOCQ)]
 (b) What is meant by 'air pollution'? What are anthropogenic sources of pollutants? [[CO4](Remember/LOCQ)]
(2 + 6) + (3 + 1) = 12
5. (a) Classify between the primary and the secondary pollutant sources, citing two examples of each. [[CO4](Remember/LOCQ)]

- (b) What do the abbreviations 'TSPM' and 'RSPM' stand for? Give two examples of particulates. What are 'criteria pollutants'? Why are they called so?

[[C04](Remember/LOCQ)]

(2 + 2) + (6 + 2) = 12

Group - D

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

[[C04](Understand/LOCQ)]

- (b) What is Eutrophication? Explain how Eutrophication endangers aquatic life.

[[C04](Understand/LOCQ)]

6 + 6 = 12

7. (a) What is noise?

[[C04](Remember/LOCQ)]

- (b) How is noise measured?

[[C04](Remember/LOCQ)]

- (c) What sound power levels results from combining the following three levels: 68 dB, 79 dB, and 75 dB?

[[C04](Analyse/IOCQ)]

- (d) What are the preventive and control measures that may be taken for reducing noise pollution?

[[C04](Remember/LOCQ)]

1 + 2 + 3 + 6 = 12

Group - E

8. (a) What are hazardous substances? Name a few hazardous substances which are responsible for climatic change across the world.

[[C04](Remember/LOCQ)]

- (b) When drinking water is disinfected with chlorine, an undesired by-product, chloroform (CHCl_3), may be formed. Suppose a 70 kg person drinks 2.5 L of water every day with a chloroform concentration of 0.15 mg/L. Consider chloroform is a class B2 probable human carcinogen with a potency factor of $6.1 \times 10^{-3} \text{ (mg/kg-day)}^{-1}$.

- (i) Find the upper-bounded cancer risk for this individual.

- (ii) If a city with 500000 people in it also drinks the same amount of this water how many extra cancers per year would be expected? Assume the standard 65 year lifetime and there are 17 cancers per million people over 65 years period.

- (iii) Compare the extra cancers per year caused by chloroform in the drinking water with the expected number of cancer deaths from all causes. Consider the cancer death rate is 190 per lakh in a year.

[[C05](Evaluate/HOCQ)]

(2 + 3) + 7 = 12

9. (a) What is solid waste management? Explain its causes and effects.

[[C02](Remember/LOCQ)]

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

[[C06](Understand/LOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	77.08	9.38	13.54