

**ENVIRONMENTAL POLLUTION & CONTROL  
(CIVL 4163)**

**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) Acid rains are caused by the following pollutants:  
(a) SO<sub>2</sub> and O<sub>3</sub> (b) SO<sub>2</sub> and NO<sub>x</sub>  
(c) NO<sub>x</sub> and O<sub>3</sub> (d) CO and SO<sub>2</sub>
- (ii) When Adiabatic Lapse Rate (ALR) is more than Environmental Lapse Rate (ELR), then the ELR can be called as  
(a) super adiabatic lapse rate (b) sub adiabatic lapse rate  
(c) dry adiabatic lapse rate (d) wet adiabatic lapse rate.
- (iii) Select the secondary air pollutants among the following:  
(a) Ozone and Carbon Monoxide  
(b) Peroxy-acyl-nitrate (PAN) and Ozone  
(c) Peroxy-acyl-nitrate and Carbon Monoxide  
(d) Carbon Monoxide and Sulphur dioxide
- (iv) When was the Water (Prevention and Control of Pollution) Act enacted by the Indian parliament?  
(a) 1970 (b) 1974  
(c) 1980 (d) 1985.
- (v) *Leachate* is a colored liquid, that comes out from  
(a) septic tank (b) sanitary landfill  
(c) compost plants (d) aerated lagoons.
- (vi) Electrostatic precipitators are used as pollution control device for the separation of:  
(a) SO<sub>2</sub> (b) NO<sub>x</sub>  
(c) Hydrocarbon (d) Particulate matter.

- (vii) Which of the following parameters is not included in the routine characterization of solid waste for its physical composition?  
(a) Moisture content (b) Density  
(c) Particulate size analysis (d) Energy value.
- (viii) Which one of the following methods of solid waste management conserves energy most efficiently in the form of gas or oil?  
(a) Incineration with heat recovery (b) Combusting  
(c) Fluidized-bed incineration (d) Pyrolysis.
- (ix) The unit for frequency of sound is  
(a) Hertz (b) Decibels  
(c) Pascal (d) Newton.
- (x) Subsidence inversion can be related to  
(a) Cyclone (b) Anti cyclone  
(c) Radiation (d) Tornado.

**Group - B**

2. (a) Differentiate between: Environmental lapse Rate (ELR) and Adiabatic Lapse Rate (ALR). Also differentiate between dry and wet ALRs.  
(b) How, and in what manner, the environmental lapse rate and adiabatic lapse rate, affect the dispersion of an air pollutant into the atmosphere? Draw the various possible behaviours of the emitted plume.  
**5 + 7 = 12**
3. (a) What do you mean by secondary pollutants? Explain the formation of photochemical smog.  
(b) What do you mean by the effective height of a chimney? During rush hour on a busy road crossing, nearly 1200 vehicles ply per hour at an average speed of 20kmph. Of these about 70% cars use leaded petrol. The average fuel consumption is one litre for an average of 8km of travel. Considering that 70% of the lead present in the fuel is emitted in the form of particulate aerosol, find the emission rate of lead aerosol in the ambient air.  
(Given concentration of lead in the fuel 0.4µg/L)  
**5 + (2 + 5) = 12**

**Group - C**

- 4 Write short notes on **any three** of the following (Mention the merits, demerits and the principle with neat sketches):
- Fabric filters.
  - Wet scrubbers.
  - Gravitational settling chambers.
  - Absorption units.
- (3 × 4) = 12**
5. (a) Design a sludge digestion tank with the following data:
- Average flow of sewage =  $60 \times 10^6$  litres/day
  - Total suspended solids in raw sewage = 350 mg/litre
  - Volatile suspended solids = 250 mg/litre
  - Moisture content of the digested sludge = 87%
- (b) Enumerate the engineering measures that are adopted to reduce the emission of air pollutants from automobiles.

**6 + 6 = 12****Group - D**

6. (a) Differentiate between continuous noise, intermittent noise and impulse noise.
- (b) Enumerate the measures that may be taken to have an effective control on Noise pollution.
- 5 + 7 = 12**
7. (a) 50 dB noise lasting for 55 mins is followed by 90 dB noise lasting for 5 mins. What is  $L_{eq}$  of this noise?
- (b) Write detailed notes on:
- Global warming and greenhouse gases.
  - Carbon trading and clean development mechanism.

**2 + (5 × 2) = 12****Group - E**

8. (a) What are the different types of solid waste collection system? Explain them briefly with neat sketches.
- (b) Solid wastes from a commercial area are to be collected using a stationary container collection system having  $4m^3$  containers. Determine the appropriate truck capacity for the following conditions:

- Container size:  $4m^3$   
 Container utilization factor = 0.75  
 Average number of containers at each location = 2  
 Collection-vehicle compaction ratio = 2.5  
 Container unloading time = 0.1 hr/container  
 Average drive time between container location = 0.1 hr  
 One way haul distance = 30 Km  
 Speed limit = 88 Km/hr  
 Time from garage to first container location = 0.33 hr  
 Time from last container location to garage = 0.25 hr  
 Number of trips to disposal site per day = 2  
 Length of workday = 8 hr  
 ( $s = 0.1hr/trip$ ,  $a = 0.016$ ,  $b = 0.011$ ).

**6 + 6 = 12**

9. (a) Write short notes on **any two** of the following:
- Indore Method of refuse disposal
  - Bangalore Method of refuse disposal
  - Vermi-composting.
- (b) Differentiate between 'refuse' & 'garbage'.

**(4 × 2) + 4 = 12**