

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FIFTH YEAR FIRST SEMESTER EXAM 2025**Subject: ENVIRONMENTAL POLLUTION & CONTROL****Time : Three hours****Part – I (50)****Full Marks: 100****Use a separate Answer-Script for each part**

Question No.	Answer Question No. 1 and any <i>Two</i> from the rest	Marks
1	(a) Give an example of a primary air pollutant and one of its control option. (b) What is the product of mixing depth and wind speed known as? (c) What is the size range of Respirable Particulate Matter? (d) What is Inversion? When does the Radiation Inversion usually occur? (e) Give two examples of greenhouse gases. (f) Name and draw the plume pattern caused by 'Stable' atmospheric condition. (g) Why is saturated adiabatic lapse rate is less than the dry one? (h) Give two examples of Photochemical Oxidants. (i) Write down the harmful effects of Lead. (j) What is the cause of stone cancer?	[2x10]
2	(a) Define adiabatic lapse rate and ambient lapse rate. (b) With a sketch, define conditional stability, absolutely stable and absolutely unstable conditions of atmosphere. (c) With a sketch, describe 'Superadiabatic' condition of atmosphere. (d) Draw the looping and fanning plume pattern mentioning the stability condition of the atmosphere.	[4] [4] [5] [2]
3	(a) What is the cause of acid rain? What is the maximum pH value of acid rain? Give an example of the effect of acid rain on materials. (b) What are the causes of SO ₂ emission? What are the welfare effects of SO ₂ ? (c) Describe 'Rainout' and 'Washout'. (d) Name one Primary air pollutant which causes Photochemical Smog.	[4] [5] [4] [2]
4	(a) Describe the NO ₂ photolytic cycle for creation and destruction of ozone.	[5]

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(b) Describe the National Air Quality Index.	[5]
(c) Calculate the minimum size of particle that will be removed with 100% efficiency from a settling chamber under the following conditions Horizontal flow velocity of air = 0.6m/s Viscosity of air 2.5×10^{-5} kg/m.s at 70°C Specific gravity of particle 1.5 Length of settling chamber= 7.0 m Height of settling chamber= 2.0 m Correction factor = 1.5	[5]

No. of
Questions

Part II (50 Marks)

Marks

Answer Question Number 1 is Compulsory and any two from the rest. Answer should be brief and to the point. All the notations have their usual meaning. Assume relevant data if not provided. All the relevant drawings should be in pencil.

Q1. (A) Fill the Blanks:

- i. The reference root mean square of sound pressure has a magnitude of _____ for calculating sound pressure level. 1×10
- ii. NIMBY is associated with _____ waste management.
- iii. Numerically 1sone sound is equal to _____ phon sound.
- iv. In oxygen sag curve where dissolve oxygen deficit is maximum is known as _____
- v. Thermal treatment of organic solid waste in oxygen free atmosphere is known as _____
- vi. The calorific value of solid waste devoid of latent heat required to vaporise moisture is known as _____
- vii. Boron and is the important parameter of _____ class of water use.
- viii. For collection or transfer of solid waste the round-trip distance travelled by vehicle with loaded container from pick up point to disposal site is known as _____
- ix. For 1/1 octave band analysis if lower and upper frequencies are γ_l and γ_u respectively then the central frequency is _____
- x. At light compensation zone the productivity and respiration ratio is _____

(B) Write true and false with proper justification. **No marks will be given if justification will not be written.** 2×5

- i. Streeter Phelps's equation for determining DO deficit after pollution discharge in river water is an approximate method.
- ii. If lignin content of solid waste is very high then you should recommend biological method for treatment of the solid waste.
- iii. Cultural eutrophication along with thermal stratification is very harmful for aquatic life.
- iv. If the sound level meter showing the same measurement in the display meter for A, B and C network then the sound is measured at 1000Hz frequency.
- v. According to the hierarchy of integrated solid waste management landfill is the most preferable option.

- Q 2.(A) A river has a flow of approximately 410 million gallons per day (mgd), a temperature of 18°C, a BOD₅ of 3.0 mg/L, a dissolved oxygen at 90 % of saturation, and an average velocity of 2 miles per hour. There is a domestic sewage treatment plant (15 mgd) located near this point that has an influent BOD₅ of 250 mg/L. The plant removes 95 % of the BOD₅, has an effluent temperature of 25 °C, and an effluent dissolved oxygen concentration

6+2

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Questions****Part II (50 Marks)****Marks**

of 0 mg/L. Experiments conducted at 20°C yield a k_1 of 0.4/d and a k_2 of 0.55/d. Determine the minimum oxygen concentration and its location at downstream. Estimate also the 20 °C BOD₅ of a sample taken at that point. Saturation concentrations of DO at 18°C and 20 °C are 9.45 and 9.08mg/L respectively.

- Q2. (B) Why “after a river getting polluted cannot restore its original quality” even after self-purification? With neat labelled sketch discuss different salient points of oxygen sag curve. 2+5
- Q 3. (A) What is the significance of installing weighting network in sound level meter? Why the concept of root mean square of pressure is there in relation with sound pollution. What do you mean by equivalent sound level? What is traffic noise index? 2×4
- (B) Determine the total sound pressure level at a distance 1000ft from an instrument generating following sound level in outdoor environment detected by sound measuring instrument using B network with 1/1 Octave band analysis. Also determine corresponding sound intensity level and sound power level at that distance neglecting directivity effect. 4+1+2

Center frequency (Hz)	31.5	63	125	250	500	1000	2000	4000
Sound Level [dB(B)]	63	65	67	64	68	69	70	62
Correction Factor	-17.1	-9.3	-4.2	-1.3	-0.3	0.0	-0.1	-0.7

- Q4.(A) Explain: stationary container collection system; engineered landfill; 3-T in combustion system. Write the names of the micro-organisms mainly responsible for aerobic composting. Why weight volume analysis is superior than load count analysis for quantification of solid waste for municipal area? 2×5
- (B) Match Column A with B choosing most appropriate option 5

A

- i. Calorific value
- ii. Field capacity
- iii. Fusing point of ash
- iv. Fixed carbon
- v. Permeability

B

- i. Muffle furnace
- ii. Bomb calorimeter
- iii. Liner
- iv. Aggregate
- v. Leachate collection system