Ref. No.: Ex/CE/5/T/503/2024

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FIFTH YEAR
FIRST SEMESTER EXAM 2024
Subject: ENVIRONMENTAL POLLUTION & CONTROL

Time : Three hours **Full Marks : 100**

(50 Marks for each Part)

Use a separate Answer-Script for each part

Question No.	PART I (50 Marks) **Answer Question No. 1 and any *Two* from the rest**	Marks
1	(a) Give example of a secondary air pollutant and one of its control option. (b) What are the characteristics of air pollutant to be 'criteria'? (c) Name the air pollutant excluded from NAAQS and give reason for its exclusion. (d) Give an example of 'pollution prevention' step to minimise flyash from thermal power plant. (e) Give example of two greenhouse gases. (f) Name and draw the plume pattern caused by 'Unstable' atmospheric condition. (g) Why is saturated adiabatic lapse rate is less than the dry one? (h) What is the full form of NAAQS? (i) Differentiate between the tropospheric and stratospheric ozone. (j) Why is CO regarded as criteria pollutant, but CO_2 is not regarded so?	[2x10]

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(50)

2	(a) Define adiabatic lapse rate and environmental lapse rate.	[4]
	(b) With a sketch, define conditional stability, absolutely stable and absolutely unstable conditions of atmosphere.	[4]
	(c) With a sketch, describe 'Subsidence' and 'Radiation' Inversions.	[5]
	(d) Draw the plume pattern which may be most harmful to ground level receptors.	[2]
3	(a) What is the cause of acid rain? What is the maximum pH value of acid rain? Give an example of effect of acid rain on materials.	[4]
	(b) Differentiate between Primary and Secondary air pollutants and give examples of both.	[5]
	(c) Describe 'Rainout' and 'Washout'.	[4]
	(d) Name one Primary air pollutant which causes Photochemical Smog.	[2]
4	(a) Give examples of Force-field settlers for control of air pollutants.	[3]
	(b) Derive the expression for diameter of particle which can be removed by gravitational settling chambers at an efficiency of 100% using Stoke's equation.	[7]
	(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 deg 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]

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B.E.(C.E.) 5th YEAR EXAMINATION, 2024

(1st Semester)

SUBJECT: Environmental Pollution and Control

Full Marks 100

Time: Three hours

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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:** 1×10

i. As per Noise Standard for firecrakers by MoEF dated 5th October, 1999, the maximum standard of noise level from single firecracker is _____

ii. Full form of NIMBY is_____

iii. Numerically 40 Phon sound is equal to _____sone sound.

iv. Ratio between reoxygenetion constant and deoxygenetion constant is defined as _____

v. Thermal treatment of organic solid waste under less than stoichiometric requirement of oxygen is known as_____

vi. After pollution discharge in a stream body the point where dissolved oxygen concentration is minimum is known as _____

vii. For propagation of wild life and fisheries the minimum dissolved oxygen concentration should be maintained_____

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 octave band analysis the ratio between lower and upper frequency of sound should be always _____

x. Water stress indicator is the ratio between_____

Q 1.B) **Write true and false with proper justification. No marks will be given if justification will not be written.** 2×5

i. Streeter Phelp's equation for determining DO deficit after pollution discharge in river water is an accurate method.

ii. Overturning of lake is common phenomena in winter and summer.

iii. For municipal solid waste of Japan thermal treatment is the best method.

iv. The instrument used for measuring sound is known as sound level meter instead of sound meter.

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No. of Questions	Part II (50 Marks)	Marks

Q 1.B) v. Liner is optional for designing of engineered landfill system.

Q 2.a) The sewage discharge of a town is 1.72 cum/sec. The sewage is discharged into a river, whose flow rate is 7240 litres/sec. If the minimum dissolved oxygen to be maintained in the river conforming to propagation of wild life and fisheries, determine the degree of sewage treatment to be done with the following data: 8

(i) Temperature of sewage = temperature of river =20°C
(ii) Value of k_1=0.1 per day and value of k_2=0.5 per day
(iii) BOD_5 at 20°C of sewage =225 mg/litre
(iv) BOD_5 at 20°C of river = 1.2mg/lite
(v) Dissolved oxygen in sewage = zero
(vi) Dissolved oxygen in river = 80% of saturation value
(vii) Saturation DO at 20°C =9.17 mg/litre

Q 2.b) Write with justification why thermal stratification along with eutrophication is the most severe condition for lake water. With a neat sketch write a short note on different zones of pollution for a river. 2+5

Q 3.a) Determine the total sound pressure level at a distance 500ft from an instrument generating following sound level in outdoor environment detected by sound measuring instrument using A network with 1/1 Octave band analysis. Also determine corresponding sound intensity level and sound power at that distance neglecting directivity effect. 4+1 +3

Center frequency (Hz)	31.5	63	125	250	500	1000	2000	4000
Sound Level [dB(A)]	63	65	67	64	68	69	70	62
Correction Factor	-39.4	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0

Q 3.b) Define mentioning unit of measurement: loundness; frequency and equivalent sound pressure level. Mention one control measures of propagation of sound through medium. 2×3+1

Q4.a) Identify proximate and ultimate chemical characteristics of solid waste from the list: volatile solid, calorific value, moisture content and fixed carbon. Write the name of the conventional method that is commonly used for quantification of solid waste in the municipalities in India presently. Draw the labelled hierarchy of integrated solid waste 2+1+ 3+2+2

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management. Write the name of by-product(s) of anaerobic digestion of organic portion of solid waste. Mention the 3-T applicable for combustion of solid waste.

Q4.b) Calculate the compacted density for the solid waste required to be maintained for the following composition based on 1000 kg of waste sample if compaction factor is 1.5:

Component	*% by mass*	*Typical density (kg/m^3)*
Food waste	12	290
Paper	40	85
Cardboard	8	50
Plastic	4	65
Garden trimmings	15	105
Wood	5	240
Tin cans	16	90