

M.E. Civil Engineering First Year First Semester Examination 2025

Environmental Pollution & Management

Time: Three Hours

Part-1

Full Marks: 100

Use separate Answer-Scripts for each part (60 marks for Part I and 40 marks for Part II)

1. Answer the following twenty (20) questions very briefly, preferably in *a few words*:
- a) What is the least preferred step in the waste management hierarchy flowchart?
 - b) Give an example of minimisation of gaseous waste before its generation.
 - c) Why is use of PPC is an example of waste minimization after its generation?
 - d) What is a primary air pollutant? e) What does the subscript in PM₁₀ and PM_{2.5} represent?
 - f) What is the most common unit to express the concentration of criteria air pollutants (CAPs)?
 - g) Name two particulate *air pollutants* which are generally measured by high volume samplers.
 - h) Name an *air pollutant that was removed from NAAQS in 2009*? i) Name two organic CAPs.
 - j) Name one *primary CAP* to be controlled to control acid rain.
 - k) Name the GHG whose *GWP is unity*. l) Comment about ODPs of HCFCs
 - m) Write the *catalytic reactions* related with control of photochemical smog.
 - n) What is 'NNE' wind? o) Name a air pollution control device whose by-product is liquid waste.
 - p) Name the most abundant CAP. q) Name a secondary gaseous CAP. r) Name a metalloid CAP.
 - s) Which CAP can be reduced by controlling the peak flame temperature?
 - t) Which CAP can be reduced by pulverizing and washing coal? 1 X 20 = 20

[Turn over

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2. a) Correlate the terms 'waste treatment', 'waste minimization', 'threshold values', 'carrying capacity' and 'sustainable development' with examples from the field of air pollution.
- b) Draw the infrared portion of combined absorption spectra and define natural Greenhouse Effect.
- c) Define Global Warming Potential (GWP)? Mention the factors which may affect GWP.
- d) 'Climate Change and Ozone Depletion problem should be solved in unison.'-explain.

7+4+4+5=20

3. a) (I) Write the chemical formula of followings (i) H-1201 (ii) HFC-134 (III) CFC-113
(II) Write the complete code number of followings (i) $C_2FH_3Cl_2$ (ii) CF_2HCl
- b) Define Acid Rain. Describe its effect on materials, aquatic ecosystem, and forest ecosystem.
- c) Describe NO-NO₂-O₃ cycle. Describe the effect of hydrocarbons on this cycle.
- d) List all possible plume patterns during inversions. Among them which one is the most
(i) prominent? (ii) dangerous?

5+5+5+5=20

Form A: Paper –Setting Blank

Ref No.: Ex/PG/CIV/PE/T/114A/2025

M.E. CIVIL ENGG. 1st YEAR 1st SEMESTER EXAMINATION, 2025(1st /-2nd Semester / Repeat / Supplementary / Annual /-Biannual)

SUBJECT: ENVIRONMENTAL POLLUTION & MANAGEMENT

(Name in full)

Full Marks: 100

Time: ~~Two hours/Three hours/Four hours/ Six hours~~

(40 marks for this part)

Use a separate Answer-Script for each part

No. of Question	Part-II	Marks
	<u>Answer Question-1 and any two from the rest</u>	
Q.1) a)	State the cases that may arise on superimposing “Use Map” over the “Quality Map” for a river stretch.	6
b)	What do you mean by “Thermal Stratification” of any water body? Describe with the help of a neat sketch the effect of “Thermal Stratification” on Dissolved Oxygen level of an oligotrophic and eutrophic lake during different seasons.	3+6
c)	Discuss on the common noise descriptors used for describing the extent of noise pollution in the sphere of community and traffic noise .	5
Q.2) a)	A stretch of river receives sewage from two townships having their separate sewage treatment plant. The computed values of pertinent parameters are as follows: k. $U_0 = 4.27 \text{ mg/L}$ of DO deficit l. $U_1 = (-)0.05 \text{ mg/L}$ of DO deficit/percent treatment m. $S_0 = 9.8 \text{ mg/L}$ of DO deficit n. $S_1 = (-)0.05 \text{ mg/L}$ of DO deficit/percent treatment o. $S_2 = (-)0.08 \text{ mg/L}$ of DO deficit/percent treatment Necessary of cost-related parameters are: i) $C_1 = \text{Rs. } 38,00,000/-$ ii) $C_2 = \text{Rs. } 37,00,000/-$ iii) $a_1 = \text{Rs. } 42,00,000/-$ per 100% treatment efficiency iv) $a_2 = \text{Rs. } 26,00,000/-$ per 100% treatment efficiency v) $D_{a1} = 2.4 \text{ mg/L}$ vi) $D_{a2} = 3.6 \text{ mg/L}$ Determine the optimized annual cost for the entire system graphically following the concept of system analysis.	10

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Question	Part-II	Marks																																			
Q.3) a)	<p>An electrical drilling machine was subjected to a noise monitoring study and the results obtained in terms of sound pressure level (L_P) and sound power level (L_W) at a 25 m distance are furnished in the table below. Calculate the total sound pressure level (L_{PT}) and total sound level (L_{PAT}) at a distance of 50m from the unit. Consider the propagation of sound under outdoor condition.</p> <table border="1"> <thead> <tr> <th rowspan="2">Levels</th> <th colspan="8">Octave band centre frequency (in Hertz)</th> </tr> <tr> <th>63</th> <th>125</th> <th>250</th> <th>500</th> <th>1000</th> <th>2000</th> <th>4000</th> <th>8000</th> </tr> </thead> <tbody> <tr> <td>L_W in dB</td> <td>96</td> <td>92</td> <td>91</td> <td>90</td> <td>85</td> <td>88</td> <td>82</td> <td>79</td> </tr> <tr> <td>L_P in dB</td> <td>66</td> <td>62</td> <td>69</td> <td>67</td> <td>64</td> <td>59</td> <td>60</td> <td>57</td> </tr> </tbody> </table>	Levels	Octave band centre frequency (in Hertz)								63	125	250	500	1000	2000	4000	8000	L_W in dB	96	92	91	90	85	88	82	79	L_P in dB	66	62	69	67	64	59	60	57	(5+5)
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Q.4) a)	Discuss on the significance of “ Frequency Band Analysis ”.	4																																			
b)	<p>Vehicular Noise Data was collected for an important traffic intersection and are furnished below:</p> <table border="1"> <thead> <tr> <th>Time (sec)</th> <th>5</th> <th>15</th> <th>30</th> <th>40</th> <th>50</th> <th>70</th> <th>85</th> <th>90</th> <th>105</th> <th>125</th> <th>140</th> <th>150</th> </tr> </thead> <tbody> <tr> <td>Sound Level dB(A)</td> <td>76</td> <td>75</td> <td>73</td> <td>74</td> <td>81</td> <td>80</td> <td>78</td> <td>79</td> <td>77</td> <td>82</td> <td>71</td> <td>70</td> </tr> </tbody> </table> <p>Compute i) Equivalent Sound Level (L_{eq}) ii) Traffic Noise Index (TNI)</p>	Time (sec)	5	15	30	40	50	70	85	90	105	125	140	150	Sound Level dB(A)	76	75	73	74	81	80	78	79	77	82	71	70	(3+3)									
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