

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

Environmental Pollution & Management

Time: Three Hours

Full Marks: 100

Use separate Answer-Scripts for each part

Part-1 (60 Marks)

Answer Question No. 1 & 2 and any Two from the rest.

1. Answer in one or two words:

- a) What is the common reason of inclusion of two organic air pollutants in the National Ambient Air Quality Standards (NAAQS) list as criteria air pollutants (CAP)?
- b) What does the subscript in PM₁₀ and PM_{2.5} represent?
- c) Mention the threshold pH of unpolluted rain water.
- d) Name two CAPs which should be minimized to control air pollution due to secondary particulate.
- e) Mention two particulate CAPs, which dictate AQI of India.
- f) What is the wavelength range of the UV ray which can reach to earth during ozone depletion?
- g) Name two gaseous CAPs which may be measured by high volume samplers along with particulates.
- h) When was suspended particulate matter (SPM) excluded from NAAQS?
- i) Name the PAH with five benzene rings only.
- j) What is the anhydride of sulfurous acid? 1X10=10

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2. Answer very briefly

- a) Why waste treatment may not be sufficient to achieve the goal of sustainable development?
- b) Why is CO regarded as a CAP?
- c) Mention different mathematical units used to express the threshold concentrations of CAPs as mentioned in NAAQS table.
- d) Write the equation for formation of the CAP which is precursor for the formation of main photochemical oxidant.
- e) Why pulverization and subsequent washing of coal cannot minimize SO₂ completely?
- f) Why change of process is only practical option for minimization of NO_x, before its generation?
- g) Why indoor air quality standard should not be same as ambient air quality standard?
- h) Mention two basic differences between a Halon and a CFC?
- i) 'Photochemical smog is also called _____ smog', mention two different words to fill up.
- j) Draw a sketch to define mixing depth. 2X10=20

3. a) Draw the combined absorption spectra of the atmosphere and define natural and man-made Greenhouse Effect from the spectra drawn.
- b) Write the chemical formula of the following compounds: (i) HCFC-31 (ii) H-2311 (iii) CFC-113
- c) Write code number of the following compounds: (i) CH₂F₄ (ii) CFCL₂CH₃ 10+3+2=15

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4. a) What is classical smog? Mention two CAPs related with this type of smog. Comment about their combined effect on respiratory system of human beings.
- b) Write the following equations of the reaction describing
- (i) the effect of Acid Rain on marbles
 - (ii) formation of bicarbonate acidity in rain water.
 - (iii) natural destruction of tropospheric ozone
 - (iv) formation of stratospheric ozone
- 7+8=15**
5. a) Compare stable and absolutely stable condition with the help of a sketch. What is the environmental lapse rate during neutral stability condition?
- b) Name and draw the plume patterns during following conditions:
- (i) ground level inversion below the stack height
 - (ii) ground level inversion above the stack height
 - (iii) ground level inversion below the stack height and an elevated inversion
 - (iv) stable calm condition
- 5+10=15**

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M.TECH. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING FIRST YEAR FIRST SEMESTER EXAM 2025

Form A: Paper –Setting Blank

Ref No.: Ex/PG/CE/T/115C/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)	What are the essential characteristics of an “Eutrophic Lake”?	4
b)	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.	6
c)	Establish the relationship between different sound levels (L_I , L_P and L_w) in the context of “Outdoor Noise”.	6
d)	Derive the necessary expression for “Addition of Sound Intensity Levels”.	4
Q.2) a)	<p>A township discharges 5.45MGD of raw sewage, containing 7.3mg/L of phosphorous and 16mg/L of nitrogen, into an adjacent river that enters a lake short distance downstream.. For river it is given: i) average flow rate is 5823 l/sec. ii) Mean nitrogen content= 0.22mg/L iii) Mean phosphorous content= 0.04mg/L.</p> <p>The lake is used as a municipal water source and has a surface area of 32,450 acres and a mean depth of 10m. Developments around the lake contribute an estimated 1846 Kg of phosphorous and 11,881Kg of nitrogen annually.</p> <p>Given for 10m depth, permissible loading for nitrogen= 1.5gm/m²/year and permissible loading for phosphorous= 0.1gm/m²/year. Estimate the followings:</p> <ol style="list-style-type: none"> Nitrogen and phosphorous loadings from lake, river, sewage and in total. Determine respective % removal of nitrogen and phosphorous in the sewage treatment plant. 	(6+4)

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(40 marks for this part)

No. of Question	PART II	Marks																																			
Q.3) a)	<p>An electrical saw 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 28m 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>Lw in dB</td> <td>97</td> <td>95</td> <td>91</td> <td>92</td> <td>89</td> <td>86</td> <td>87</td> <td>78</td> </tr> <tr> <td>Lp in dB</td> <td>65</td> <td>63</td> <td>59</td> <td>61</td> <td>60</td> <td>58</td> <td>58</td> <td>55</td> </tr> </tbody> </table>	Levels	Octave band centre frequency (in Hertz)								63	125	250	500	1000	2000	4000	8000	Lw in dB	97	95	91	92	89	86	87	78	Lp in dB	65	63	59	61	60	58	58	55	(5+5)
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Q.4) a) b)	<p>Discuss on the significance of "Frequency Band Analysis".</p> <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>10</th> <th>30</th> <th>45</th> <th>55</th> <th>70</th> <th>80</th> <th>95</th> <th>105</th> <th>120</th> <th>130</th> <th>150</th> </tr> </thead> <tbody> <tr> <td>Sound Level dB(A)</td> <td>70</td> <td>76</td> <td>77</td> <td>78</td> <td>81</td> <td>82</td> <td>75</td> <td>79</td> <td>73</td> <td>80</td> <td>71</td> <td>74</td> </tr> </tbody> </table> <p>Compute i) Equivalent Sound Level (L_{eq}) ii) Traffic Noise Index (TNI)</p>	Time (sec)	5	10	30	45	55	70	80	95	105	120	130	150	Sound Level dB(A)	70	76	77	78	81	82	75	79	73	80	71	74	4 (3+3)									
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