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MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL UNIVERSITY



FIRST SEMESTER M. TECH. INDUSTRIAL POLLUTION CONTROL END SEMESTER EXAMINATION

SUBJECT: AIR POLLUTION CONTROL AND EQUIPMENT DESIGN (CHE 555)

Time: 3 HOURS

Max.Marks: 100

Note: Answer **ANY FIVE FULL** questions Each question carries 20 Marks

1 A	i) Describe the different classifications of air pollutants.	
	ii) Describe any two air pollution monitoring objectives	5*2=10M
1 B	Explain briefly about the possible approaches in controlling NOx.	10 M

2 A	A volume of 10^8 scf per day of natural gas which contains 10,000 ppm (1 percent) of H ₂ S is treated in an absorber-stripping unit to reduce H ₂ S to 4 ppm. The absorbent used is a 2N solution of monoethanolamine at 25°C. Estimate the required absorbent flowrate by considering liquid flowrate /gas flowrate (L/G) as 622. Given that yi*= 0.8yi and Pyi*= (0.00281psi) exp (195 xH ₂ S).	10 M
2 B	Write in detail about sources of CO in petroleum refining and solid waste incineration and explain the control techniques in the sources given above.	10 M

3 A	With the help of a flow diagram explain about CO_2 capture Technologies and write in detail about post combustion process.	10 M
3 B	What are the control techniques of VOC'S? Explain clearly about the controlling process using adsorption.	10 M

4 A	Derive the equation for terminal settling velocity using stokes law. Write in detail about behavior of particles in the atmosphere.	10 M
4 B	With the help of a diagram clearly explain about gravity settlers for control of particulate pollutants and derive the efficiency for the	10 M

block and mixed model?	

5 A	In a venture scrubber the throat velocity is 122 m/s. the particles to be collected have diameters of 1 μ , and the droplet diameter is 100 μ . We are feeding 10 ⁻³ m ³ of liquid per m ³ of gas to the scrubber. At a point where V _{Rel} =0.9V _G , what is the rate of decrease in particle concentration in the gas phase. (μ =1.8 ×10 ⁻⁵ kg/m.s, ρ =2000 kg/m ³).	10 M
5 B	Derive c= b+ (qL/uH) for a fixed bed air pollution concentration model. The meteorological conditions described in a fixed bed model (u=3 m/s, H=1000m) occur 40 percent of time. For the remaining 60 percent, the wind blows at right angles at velocity 6 m/s and the same mixing height. What is the annual average concentration of CO in this city? The emission per unit rate is 4×10^{-6} g/s.m2 and L= 5Km. the concentration c of CO over the city is given by 25 µg/m ³ .	10 M

6A	Clearly explain about the concept of plume penetration and effect of temperature profile on plume rise with a help of neat diagrams.					15 M
6 B	Calculate the buoy conditions:	ancy flux	of a source	for the	following	
		Vs	19 m/s			5 M
		ds	3m			0 111
		Ts	400 °K			
		Та	283 °K			
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