Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Remedial Examination April 2010

Subject code: 711801

Subject Name: Air Pollution Control Management

Date: 06 / 04 / 2010 **Time: 12.00 noon – 02.30 pm**

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain wind rose with diagram along with its application in Air pollution control planning and management. **06**

(b) What do you understand by Lapse rate? Explain plume behavior under different atmospheric stabilities. **06**

Q.2 **(a)** Explain the principle of ESP, Cyclone, Bag filter, Wet scrubber and Gravity settling chamber in Air pollution control. **06**

(b) The heat emission rate associated with a stack is 4500KJ/s, the wind speed and exit stack gas velocity is 5 and 15m/sec respectively and the inside stack diameter is 2m. Estimate the plum rise by means of the Moses and Carson general equation, the Holland formula and cancawe formula. **06**

OR

(b) The wind speed at the top of stack is 3m/s and exit stack gas velocity is 6m/s. The stack diameter is 2m.The atmospheric stability condition is neutral with an ambient temperature of 300°K and the stack gas temperature is 440°K. Estimate the plum rise in meters by Brigg's equation and by the TVA model equation. **06**

Q.3 **(a)** Sulfur dioxide is emitted at a rate of 160g/sec from a stack with an effective height of 60m. The wind speed at stack height is 6m/sec and the atmospheric stability class is D for the over cast day. Find the ground level concentration centre line at a distance of 500m from the stack in microgram per cubic meter, if σ_y and σ_z are 36 and 18.5 meters respectively. **04**

(b) Estimate the total Hydrocarbon concentration at a point of 300 meters down wind from an express highway on an over cast day. The wind is perpendicular to highway and has a speed of 4m/sec. The traffic density along the highway is 8000 vehicles/hr and the average vehicle speed is 40km/hr. the average vehicle emission rate of Hydrocarbon is $2x10^{-2}$g/sec. assume σ_z at 300 meter distance as 12 meters. Also, estimate 24hr concentration of hydrocarbons down wind at 300 meters. **08**

OR

Q.3 **(a)** For the data given in example 3(a) above, determine the concentration cross-wind at 50 meter from the center line for the down wind distance of 50 meters. **04**

(b) Estimate the dust load on Kucha road from a traffic density of 30,000 trucks/day with an average speed of 15kms/hr. The observed value of dust SPM at 300meter down wind has been 500µs/m^3 and σ_z at 300 meters is 12 meters. **08**

Q.4 **(a)** Explain the sulfur- dioxide removal processes in detail along with general control methods. **06**

(b) A settling chamber is to be used to collect particles of 30 μm diameter and 2000kg/m^3 density from a stream of 5 m^3/sec of air. If the chamber is 2 meter wide and 2 meter height and if it will have 27 trays, how long must it be to give 100 % efficiency? Also, do the computations on the assumptions hold laminar condition? Compute Reynolds's number. If not how many trays required to meet laminar condition. **06**

OR

Q.4 **(a)** Explain Combustion control and flue gas control methods for NOx in detail. **06**

(b) A reverse flow cyclone with axial entry has the following dimensions: r_1=5cm, r_2=10 cm, L=1m, Volume of gases= 1m^3/sec Density of particle=1000kg/m^3 Viscosity of gas=1.84 x 10^{-5} W= 16.8cm. find θ_1, No. of turns and also the efficiency of cyclone if the particle size is 5 μm. **06**

Q.5 **(a)** A spray chamber uses water as spray fluid treating standard air containing particles with density of 1500kg/m^3, flow rate of air as 10 m^3/sec and that of water as 0.001 m^3/sec. **06**

The average droplet dia. is 2mm. Assume diameter of chamber is 2 m and length of chamber is 5 m. Estimate the no. of water droplet required and the collection efficiency of spray chamber. If $\sigma = 1$.

(b) Explain isokinetic sampling in stack monitoring. **03**

(c) An ESP has to treat 100m^3/sec of polluted gas. The length of collecting electrode is 3m and width 1.0 m. Migration velocity is 0.1m/sec and required efficiency is 99.99. Estimate collecting area and no. of plates required. **03**

OR

Q.5 **(a)** A bag house is to treat a 10 m^3/sec of with following details: **06**

Length of filter = 3 m

Dia. of bag = 15 cm

$V\infty$ = 0.1m/sec

Packing Density(c)= 0.1

Find out the total filtering area and the no. of bags required. Also estimate the pressure drop through the filter immediately after cleaning and after 3 hrs of operation. Assume k_1=30,000 NS/m^3, k_2=75,000/sec.

(b) Explain Ambient Air Quality standards recently promulgated. **03**

(c) Explain in brief Global Warming. **03**

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