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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST I1 EXAMINATION (May- 2018)
M. Tech. (II- SEM.)

COURSE CODE: 14M31CE211 MAX. MARKS: 35
COURSE NAME: Air and Noise Pollution Control
COURSE CREDIT: 3 MAX. TIME: 2 HRS

Note: Attempt all Questions. Carrying of mobile phones during exams will be treated as case of unfair means. Assume suitable data if required.

1. With neat diagrammatic sketches and detailed expressions explain the following (a) the assumptions for Gaussian plume Model. (b) Derive the general solution of Gaussian plume model and explain the significance of Gaussian Plume Model for regulatory purposes and (c) wind profile law. **(10)**

2. An electrostatic precipitator has six collecting plates 10 ft tall and 10 ft long in the direction of flow. The spacing between the plates is 9 inches (0.229 m). The ESP is to be used to collect particles having a dielectric constant of 4.0 and an effective diameter of 3 mm. The carrier gas (air at 208C) has a throughput velocity of 24 ft/s. Calculate the voltage (kV) required for 99.5% collection efficiency. Use the equation **(4)**

$$w = 1.1 \times 10^{-14} p E_d^2 d_p / \mu$$

$$p = 3D/(D+2)$$

Where, w = drift velocity in m/s; E_d =field strength at discharge electrode in V/m; d_p = particle diameter in mm; μ= gas viscosity in kg/m.hr and D = dielectric constant

3. A reverberant room has dimensions of 6m by 14m by 6m high. The measured reverberation time for the room is 7 seconds. The air in the room is at 300^0K and 101.5 kPa, at which condition the speed of sound is 355 m/s. The measured sound pressure level in the 550 Hz octave band due to the noise from pump in the room is 85 dB. Determine the sound power level for the pump in the 550 Hz octave band. **(4)**

4 Explain the terms L_{10}, L_{50}, L_{90} and their significance. Explain equivalent noise level and noise climate and how they are computed from these terms **(2)**

5 Derive the ground level center line concentration and maximum ground level concentration of pollutants from Gaussian Plume model. Plume height is H. **(2)**

6 With a neat sketch and mathematical expressions where appropriate explain the functioning of (a) Sound Level Meter (SLM), (b) Intensity Level Meter (ILM) **(4)**

7 Determine the effective stack height using the following data: (a) Physical stack is 170 m high with 1.25 m internal diameter. (b) Wind velocity is 5.17 m/s (c) Air Temperature is 18^0C. (d) Barometric pressure is 1200 millibars (1.2 atm) (e) Stack gas velocity is 8.75 m/s and (f) stack gas temperature of 128^0C. Also determine the stack height using Moses and Carson's equation for neutral conditions. **(4)**

8 A 100 m tall chimney stack emits hydrogen chloride (density = 1.64 kg/m^3) at a rate of 1 m^3 /s. The

plume initially rises a further 5m directly above the exit before being convected horizontally by a wind blowing at a speed of 10 m/s under neutral atmospheric conditions at a height of 10 m. Estimate the pollution concentration (kg/m^3) at ground level at (a) 2.5 km downwind on the centreline (b) 3.5 km downwind at 0.5km offset on the centreline. Assume wind speed at ground level conditions as 5 m/s with ***p*** value of 0.25 with σ_y = 300 and σ_z = 230 m **(5)**