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Question Paper Code : X10220

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2021
Sixth Semester
Civil Engineering
CE 8005 – AIR POLLUTION AND CONTROL ENGINEERING
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Why ozone level depletion is maximum at South Poles ?
2. Discuss various factors to be considered for selection of any ambient air monitoring location.
3. Name any one standard method for measurement and analysis for SO₂ and Ammonia.
4. How many parameters considered in developing Air Quality Index based on methodology provided by CPCB in India ?
5. Define MMD.
6. Define Air Quality index.
7. Name two control technologies for particulate matter and gaseous pollutant respectively.
8. List various approaches for control of noise pollution.
9. Differentiate Sound Power level and Sound Pressure level.
10. Differentiate primary and secondary pollutants.



PART – B

(5×13=65 Marks)

11. a) i) Discuss the importance of flow rate and temperature during gaseous sampling through RDS. **(7+6)**
ii) Discuss the health effect due to presence of oxides of sulfur and nitrogen in ambient air.

(OR)

- b) i) Briefly discuss the factors affecting collection efficiency of electrostatic precipitator. **(7+6)**
ii) Calculate the stoichiometric air to fuel ratio for the combustion of benzene, one of the aromatic compounds found in gasoline.

12. a) i) Define ventilation coefficient and its variation with dispersion capabilities. **(7+6)**
ii) Differentiate Radiative Inversion and Subsidence Inversion.

(OR)

- b) i) Differentiate super adiabatic and sub adiabatic condition of atmosphere with respect to lapse rate, plume behaviour and SODAR echograms. **(7+6)**
ii) 750 MW, Thermal power plant has a 175 m stack with inside radius 4 m, the exit velocity of stack is estimated as 14 m/s at a temperature of 135°C. Ambient temperature is 25°C. Wind velocity at stack height is estimated as 5 m/s. Find the effective height of stack if atmosphere is unstable.

13. a) Briefly describe principle and working of gravitational settling chamber for removal of dust particles from gas stream with the help of suitable diagram. **(13)**

(OR)

- b) i) A conventional cyclone of 1.0 m diameter having an entrance width of 0.25 m and entrance height of 0.5 m handles about 2.0 m³/s of particle laden gas having a specific gravity of 2500 kg/m³. Determine the cut size and efficiency as a function of the particle diameter if the efficiency number of turns of 5. **(7+6)**
ii) Calculate the terminal velocity of 7.5 micron diameter particle in air with a specific gravity of 1.8. Assume density of the air as 1.184 kg/m³ and viscosity of the medium as 1.85 × 10⁻⁵ kg/ms.

14. a) A multi-tray settling chamber having 8 trays, including the bottom surface, handles 6 m³/s of air at 20°C. The trays are spaced 0.25 m apart and the chamber is to be 1 m wide and 4 m long. What is the minimum particle size of density 2000 kg/m³ that can be collected with 100% efficiency? What will be the efficiency of the settling chamber if 50 μm particles are to be removed? Laminar flow condition within the chamber and presence of no dust initially on trays may be assumed. **(13)**

(OR)



- b) Briefly describe the working and principle of cyclone separator with the help of neat diagram. **(13)**
15. a) i) Enlist parameters affecting quality of indoor air. **(7+6)**
ii) Enlist effects of noise pollution on human.

(OR)

- b) i) A vehicle emits CO at an almost constant rate of 6.00 g/min while cruising at speeds between 20 mph and 40 mph, and emits 4.0 g/min while idling, ignoring acceleration and deceleration, calculate the average EF (g/miles), if speed is 20 mph and idle time is 5 minutes. **(7+6)**
ii) A sample of coal requires 20% excess air for complete combustion. Calculate weight of air for 250 gm of the coal if its composition is C = 81%, H = 4%, N = 1.5%, S = 1.2%, O = 3% and Ash = 9.3%.

PART – C

(1×15=15 Marks)

16. a) A posh country club has just has its sitting room paneled with new hardwood plywood paneling. The paneling emits formaldehyde at an emission rate of 20000 $\mu\text{g}/\text{m}^2\text{-day}$; and 900 ft^2 of wall space is covered. Formaldehyde decays to carbon dioxide with a first-order rate constant of 0.40 per hour. The room measures 25 ft long by 20 ft wide by 10 ft high. The average ventilation rate is 1.5 air exchanges per hour, and the outdoor concentration is zero.

Assuming that the club opens the room to members immediately after the paneling is installed, what is the maximum concentration of formaldehyde to which people are exposed ?

Assuming the initial HCHO concentration in the room is zero, how long does it take to reach 95% of the steady – state (maximum) concentration ?

(OR)

- b) A plate type electrostatic precipitator in a cement plant has 12 equal channels. The spacing between the plates is 0.18 m and the plates are 2.5 m long with an equal height. What is the collection efficiency for a gas moving at a velocity of 15000 m^3/hr ? What should be length of the plates for 99% efficiency ? Assume migration velocity is 0.10 m/s.
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