Major Examination

Time 1:00 Hour

24.75

Note: All the answers are to be written on question paper only

Question 1-5 carry 25% negative marking.

24.75

Q1. Air (Prevention and Control of Pollution) act was laid down in?

a) 1974 b) 1976 c) 1981 D) 1984

Q2. In Bhopal gas tragedy (1984), major culprit was:

(a) Methyl isocyanate b) Phosphate carbaryl (c) Carbon monoxide (d) Mercuric Sulphate

Q3. Pasquill- Gifford Stability Class "E" signifies:

a) Very Unstable b) Unstable c) Stable d) Neutral

Q4. Which is the major human health effect because of benzene air pollution:

a) Cardiovascular b) Leukemia c) Respiratory d) Brain & Kidney

Q5. For a completely unstable meteorological condition, which relationship holds true:

a) ELR=DALR b) ELR> DALR c) DALR>ELR d) DALR>>ELR

Q6. Attempt only one out of 6(a) and 6(b)

6(a). Define air pollution definition based on system approach? (1x5=5)

6(b). Write down the features/assumptions of Gaussian plume model?

Features / Assumptions of Gaussian Plume Model :-

Assumption :

* The pollutants under study are assumed to be passive (non-reactive)
* Steady state is assumed in the model. i.e. wind velocity, atmospheric etc remain constant throughout.

Features:

* The direction of wind determines the direction of plume. * One Main point missing
* For high velocity wind, the height of plume rise is very small and the conc. of pollutants near the ground surface is very high.
* The stack source in the plume model is assumed to be a point source.

3.75

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CaCO3.

Q7. Give at least one effect of Ozone, Pan, Mercury and NOx on plants/vegetation. (1)

* Ozone: Browning and formation of patches on the leaves.
* PAN (Poly acrylo Nitrile): Bronzish white specks on the lower side and veins.
* NOx: Bronzish white specks on the lower side and near veins.
* Mercury: Bronzish white specks formation on plants parts

4

Q8. Mention **four indoor sources** and corresponding pollutants in a typical household? (1x4=4)

4 indoor sources	Pollutants
(1) Faulty gas stoves and ~~pipelines~~ pipelines.	CH_4.
(2) Body odour, ~~do~~	Bioaerosols:
(3) Paints, Tiles.	VOCs (Volatile ~~organic~~ compound)
(4) ~~Ozone~~ Deodrants, Sprays.	CFCs. Chlorofluoro carbons, Ozone.
(5) Chimneys	soot (particulate matter), SO_2,

4

Q9. How marble is affected by SO_2? Briefly describe with chemistry reaction. (1x3=3)

* Marble is nothing b/w $CaCO_3$.

$$CaCO_3 + SO_2 \longrightarrow CO_2 + CaSO_4 + SO_3$$

* When SO_2 comes in contact with marble ($CaCO_3$), it degrades, loses its lustre and forms a pale-yellow appearance. This happens because it deoxidises marble by the reaction above. CO_2 and SO_2 react with moisture in the atmosphere to form corrosive acids.
* This can be easily seen in the example of Taj Mahal which has become yellow due to the SO_2 emitted by neighbouring industries.

9

Q10. A parcel is at height of 2.2Km and has a temperature of 17° C, if it rises vertically up till 4.6 Km. Calculate the temperature of parcel at that height, assuming parcel is rising under (a) dry adiabatic lapse rate and (b) saturated adiabatic lapse rate?

(1x5=5)

for dry adiabatic lapse rate

$$\frac{\partial T}{\partial Z} = -1^\circ C / 100m.$$

For saturated adiabatic lapse rate.

$$\frac{\partial T}{\partial Z} = -0.6^\circ C / 100m.$$

5

In the given Ques —.

$\partial Z = 4.6 - 2.2 = 2.4$ km $= 2.4 \times 1000$ m $= 2400$ m.

So, Temp^r for dry adiabatic $= 17 + 2400\left(\frac{-1}{100}\right)$

$= 17 - 24 = \boxed{-7^\circ C}$

Temp^r for saturated adiabatic $= 17 + 2400\left(\frac{-0.6}{100}\right)$

$= \boxed{2.6^\circ C}$

Q11. a) Write down the Gaussian plume equation and define every parameter

b) What would be the maximum ground level concentration at centre line when emission rate from a stack is 20 g/s and average wind speed is 4 m/s. Consider horizontal and vertical dispersion coefficient to be 30 m and 50 m?

(a) (1x4=4)

$$\eta(x,y,z,H) = \frac{Q_M}{2\pi\sigma_y\sigma_z U}\left(\exp\left(\frac{-y^2}{2\sigma_y^2}\right)\right)\left(\exp\left(\frac{-(z-H)^2}{2\sigma_z^2}\right) + \exp\left(\frac{z+H}{2\sigma_z}\right)\right)$$

Gaussian Plume Equation.

Here: x: conc^r. in g./m^3.

Q_M: emmission rate for stack (g/s)

H: effective stack height (m).

σ_y: dispersion coefficient in y-direction (m)

σ_x: dispersion coefficient in x-direction (m)

2 u: average wind speed (m/s)

y, z: coordinates from centre line. (m).

7)

PTO. (for Q11(b))

(b) In given this scenario,

$$\chi = \frac{Q_M}{2\pi\sigma_y\sigma_z V}$$

Given:

$Q_M = 20\ g/s.$

$\sigma_y = 30m$

$\sigma_z = 50m$

$V = 4m/s.$

$$\chi = \frac{20\ g/sec}{2\times 3.14\times 30\times 50\times 4\ m^3/sec} = \boxed{5.307\times 10^{-4}\ g/m^3}$$

Ans

$= 0.0005\ g/m^3$