Duration: 80 mins   Max Marks: 30

Q1. Following are the temperature data:

Altitude(m)	0	50	100	200	300	400	500	600
Temp (deg C)	25	24	22	21	20	19	18	19
Altitude(m)	700	800	900	1000	1100	1200	1300	1400
Temp (deg C)	19.5	20	21	22	23	24	24.5	25

Determine the mixing depth. There is a stack with an effective height 50 m releasing a plume at 29.5 deg C. Determine the plume rise? What would be the plume behavior? (Looping, coning, etc). **Note: show the analysis of data with a graph**. Use DALR for plume temperature changes.

For the same temperature profile, what is the plume rise level if the temperature of the plume is at 31.5 deg C at the point of release from Stack.   [5]

Q2. A thermal plant of 20 MW is situated in a town. The thermal efficiency of the plant is 40%. The coal burned has an energy content of six kilocalorie/kg (1 kilocalorie = 4.184 kJ) and it has an average carbon content of 55%. If the sulpher content is 3% and unburnable minerals is 15% and out of that 60% is released as fly ash out of smokestack, calculate the source strength in g/s for Sulphur and particulate matter.   [5]

Q3. A city can be modeled as a box of 25 km * 25 km. It releases 20 microgram/s/m^2 of particulate matter. The wind is only flowing in one horizontal direction perpendicular to one side of the box and leaving the box. On a clear summer day (sun is at 70 deg above horizon) with a wind speed measured by an anemometer located at 10 m elevation is 2.5 m/s and inversion layer develops at 300 m height. If the velocity at half of the inversion layer height is taken as a representative velocity for the city, what would be the particulate matter concentration in the box? Assume the terrain is rough terrain and the particulate matter is conservative and completely mixed.   [5]

Q4. The windspeed measured by an anemometer located 10 m above ground level is 4.0 m/s. The weather is cloudy summer day. The effective stack height is 250 m above ground level and the terrain is a rough terrain. If the SO$_2$ concentration at stack is 100 g/s, at what distance along downwind maximum pollution occurs? What is the corresponding maximum pollution concentration?   [5]

Q5. Explain the steps in environmental clearance process steps. The following should be mentioned in the explanation: on what conditions clearance should be obtained from Union/Central government and on what conditions it should be obtained from state government? Situations when scoping and/or other stages are not needed? When would District level Appraisal Authority be involved? What are the criticisms of EIA in India?
                                                                                                                                                 [10]

Duration: 100 mins   Max Marks: 50

Q1. Elaborately discuss the different operations with their purpose in water treatments if it is sourced from surface water. If the water is sourced from groundwater, what are the changes in these operations?   **[10]**

Q2. Write notes on the following:
   a) Emission Factors and what is their use and how to use.   **[2]**
   b) Windrose diagram and its use   **[2]**
   c) Types of smokestack plumes with corresponding ambient and DALR profiles.   **[10]**
   d) Factors affecting the dispersion of air pollution and types of Inversion.   **[6]**

Q3. Define noise. Explain (with purpose),
   a) Average sound pressure (RMS) and Sound pressure level (SPL)   **[5]**
   b) Octave band and One-third Octave band   **[5]**

Q4. Explain,
   a) Stages of risk assessment.   **[5]**
   b) Dose response assessment and explanation of dose response curve for carcinogen, non-carcinogen, threshold, non-threshold, linear-nonlinear dose responses.   **[5]**