CEL 793: AIR POLLUTION AND CONTROL

MAJOR

Time: 2 Hr.

Marks: 30
Date: 24.11.2014

Note: All answers are to be written on the answer sheet only. Nothing should be written on the question paper.

Q1. [1x4]

(a) List four principle characteristics which air quality model considers to estimate impact of source of pollution on air quality?
(b) Differentiate between neutral and super adiabatic conditions by drawing neat sketches.
(c) Draw neat sketches showing surface inversion and elevated inversion along with the lapse rate profile.
(d) Define ABL? Name the layer which is nearer to the ground where eddies are very small.

Q2. [1x4]

(a) The wind speed at reference height 10m, is 5m/sec. Find the wind speed at 20m, when the stability class is 'C' corresponding to which the exponent value is 0.20.
(b) For neutral stability and complex interactions of fluid forces in the ABL what velocity profile of the wind is applicable? On what assumption it works?
(c) Heat transfer at the surface in upward direction results into non-neutral stability conditions. Name the stability length which considers this heat transfer in formulating the wind velocity profile?
(d) If the turbulence in the ABL is not fully developed, how the energy and mass transfers take place?

Q3. [1+3]

(a) Name the three factors on which the stability categories at any given time depend?
(b) How DALR value of -1°C/100m has been obtained? Derive.

Q4. [1x4]

(a) What type of ambient air station will be established to gather the exposure of residential population? Describe its characteristics.
(b) Show with schematic diagram various types of sampling systems.
(c) Explain the methodology of estimating mixing height, if surface temperature is known at different times of the day with neat sketch?
(d) Draw a neat sketch of coning plume along with temperature profile? Mention meteorological conditions which makes this shape of the smoke.

Q5.

(a) What are the assumptions under which the Gaussian Plume algorithm works? [2]
(b) Draw a neat sketch describing the continuous point source plume used for deriving the Gaussian model. [3]
(c) Describe with neat diagram the Imaginary Plume Concept? [2]

[P.T.O.]

(d) In Gaussian model which input parameter implicitly takes into account the effect of advection. [1]

(e) The rate of emission of SO_2 from the stack of a power plant is 0.15 Kg/sec that has an effective height of 80m. The wind velocity at top of the stack is 5m/sec. Determine the ground level concentration at a distance of 3000m, downwind at the centerline of the plume and at a crosswind distance of 0.4km on either side of the centerline. Assume stability class 'C'. [6]