Energy Ecology Environment – ESL 710

Major Test

Time : 2 hrs.   MM. 50

PART : A (35 MAKRS)

1. a) Derive an expression for adiabatic lapse rate   (5)

    b) Suppose the following altitude versus temperature data has been colleeted :

Altitude (M)	0	100	200	300	400	500	600
Temp. ($^{\circ}$C)	20	18	16	15	16	17	18

    1.   What would be the mixing depth?   (2)

    2.   How high would be expect a plum to rise if it is emitted at 21 C from a 100 m staek if it rise at dry adiabatic lapse rate. What you expeet the shape of the plum to be like?   (3)

2. A stack emitting 80 g/s of NO has an effective height of 100 m. The wind specd is 4 m/s at 10 m and it is summer day (p=0.15). Estimate the ground level NO_2 eoncentration directly down wind at a distance of 2 km. Does it execeds ambient air standards of (0.05 ppm) ($\sigma y = 290$ m $\sigma z = 234$ m)   (5)

3. a) Derive an expression for earth effective black body temperature. Give the explanation for the difference hetween effective and actual mean earths temperature.   (6)

    b) The solar flux arriving at the out edge of atmosphere varies by $\pm$ 3.3 % as the earth moves in its orbit. By how many degrees would the earthe's effective temperature will vary as a result.   (4)

4. a) Given an over view of the global warming problem.   (4)

    b) International agreements on global warming   (3)

    c) Ozone layer as protective sheet and effects of CFCs.   (3)

PART : B (15 MAKRS)

1. a) Differentiate between the key features of 'C-cycle' and 'N-cycle'.
Discuss the role of microorganisms in the 'N-cycle' with the help of a neat labeled diagram. (5)

   b) write notes on any two :

   i)   Acid – mine drainage waste and control measures
   ii) Eutrophication problem and control measures
   iii) Ground water pollution and control measures (4)

   c) An effluent treatment plant is the source of P for a lake with $150 \times 10^6 \, m^2$ surface water. The effluent flow rate is $0.8 \, m^3/s$ and its P conc. is $0.05 \, g/m^3$. A stream having $20 \, m^3/s$ of flow also joins the lake. If p settling rate is estimated to be $30 \, m/yr$, estimate the average P concentration in the lake. What % removal of P at the treatment plant would be required to keep the average lake concentration below $0.01 \, g/m^3$. (4)

   d) Discuss bow 'DO' level in aquatic ecosystem is affected by 'Thermal stratification' in summer and winter. (2)