MID SEMESTOR EXAM

Attempt all questions: Marks:20

ASSUME ANY MISSING DATA

1. A completely mixed activated sludge process is to be used to treat wastewater flow of 650 m^3/hr having a soluble BOD_5 of 300 mg/l. The conc. of soluble BOD_5 escaping the treatment is 25 mg/l. The saturation constant =110 mg/l, endogeneous decay coeff is 0.07 day^{-1}, yield coeff is 0.6, max specific substrate utilization rate; k=5 day^{-1} and the conc of MLVSS is 2100mg/l. Density of air at 25^0C= 1.185 kg/m^3; Calculate:

a) the treatment efficiency----(1)
b) the mean cell residence time……(1)
c) the hydraulic retention time…….(1)
d) the volume of aeration tank…….(1)
e) mO_2……..(2)
If air is supplied to the plant at 25^0C and the oxygen transfer efficiency is 15%, BOD_5 is
   75% of the ultimate BOD, calculate the volume of air supplied to the plant.   **(4)**

2. An electrostatic precipitator is used with standard air containing dust particles of 1.0 μm diameter is in the form of a cylinder 0.4 m diameter and 2.5 m long. The volumetric flow rate of air is $0.075m^3$/s. If the electric field strength is 10^5 V/m and particle charge is 0.3 x 10^{-15} coulomb, compute the collection efficiency.
      [Data: λ= 0.071 μm, $μ_g$= 1.81x10^{-5} kg/m-s]   (5)

3. A chimney with a design stack height of 250 m is emitting SO_2 at a rate of 600 g/s on a sunny day with moderate wind speed at stack altitude; Find:
      < $ρ_{SO2}$ > (1000,0, 0, 250), < $ρ_{SO2}$ > (1000,60,0,250), < $ρ_{SO2}$ > (1000,60,25,250).
      Data: A=0.296, B= 0.119, p= 0.986, α = 0.25   (5)