ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2023 SESSION

Open-book examination Calculators: only authorized models Duration: 3 hours

14-BR-A7 SOLID WASTE ENGINEERING AND MANAGEMENT

Question 1 – 25 points

As an alternative to landfilling for the disposal of municipal solid waste, incineration can be considered because of its potential to produce energy. Name 5 aspects which need to be considered when planning an incineration plant for municipal solid waste elimination and why each one of these aspects is important?

Question 2 – 30 points

What is the life expectancy of the following property if used as a landfill? In other words, how many years of landfilling can be expected? The mass of incoming solid waste is 400 tons/day, 5 days per week, 52 weeks per year. The property requires a 30m buffer zone on its perimeter. All waste must be landfilled at least 3m above the natural water table.

Also, the property dimensions are 1000m in length by 400m in depth. Over the depth of 400m, 100m is on top of a hill, followed by a slope of 4 hor. to 1 vert. over a 30m drop and then, followed by a flat lower portion of 120m in width. The natural water table is at least 3m below the flat lower portion at all times of the year.

The density of the solid waste once landfilled is 600kg/m^3. The maximum cell size allowed 2000m^3 and it must be covered with 30cm of soil. The final site must be covered with at least 60cm of soil. The maximum landfill slope is 3 hor. to 1 vert.

Question 3 – 20 points

3.1 Define and give the purpose of an environmental life cycle analysis as can be applied to the recycling of municipal solid waste? (5 points)

3.2 Considering the recycling of cardboard, what are the important aspects to consider to conduct an environmental life cycle analysis? (15 points)

Question 4 – 25 points

Name 5 analyses you would recommend for the characterization of municipal solid wastes to plan their management and justify your selection of analysis.