CHL275

Chemical Engineering Department
Major Exam 06 May 2010

Time: 2 Hours **M.Marks:40**

Q1.Use a pressure purging technique to reduce the oxygen concentration in a 10 m^3 vessel. Determine the number of purges required to reduce the oxygen concentration to 1 ppm using pure nitrogen at a pressure of 7 atm and a temperature of 30^0C. Also determine the total nitrogen required. **(3,2)**

Q2. Calculate the explosive energy of 1 kg.mole of air at 100 atm gauge and 20^0C. Assume γ =1.4. Determine the equivalent amount of TNT. **(3,2)**

Q3. A starter is connected to a motor which is connected to a pump. The starter fails once in 50 years and requires two hours to repair. The motor fails once in 20 years and requires 36 hours to repair. The pump fails once per ten years and requires 4 hours to repair. Determine the overall failure frequency, the probability the system will fail in coming two years and the reliability for this system. **(3,3,3)**

Q4. Estimate the minimum oxygen concentration for hexane. Also determine the upper and lower flammability limits for it. **(3,3,3)**

Q5. What is the distance required to reduce the radiation level from a 20 MBq Co-60 source to 0.025 mGy/h. Exposure rate constant for Co-60 = 3.1 mGy/h/MBq at 1 cm. **(3)**

Q6. A large vessel (50,000 gal) is being filled with toluene. Compute Q,V and J during the filling operation when the vessel is half full and where F = 100 gallons per minute, I_S = 1.5 x10^{-3} amp., liquid conductivity = 10^{-11} mho/cm, dielectric constant = 2.4. **(3,3,3)**