ASSIGNMENT 2 PART II

Be sure to include a statement of academic integrity with your solutions to part II, and to submit a PDF for your solution (other formats will not be graded). Finally, note that you are required to show your work for full credit --- correct numeric answers may earn you little credit unless you show your work. [Total of 24 marks]

DUE DATE Feb 23rd

PREFACE TO QUESTIONS 1 AND 2.

Gas-line ruptures (pipeline breaks causing gas release and explosions) are of increasing concern throughout North America.

QUESTION 1 [7 marks]

A city has calculated the probability of having a significant rupture in a year: p = **0.05**. This probability remains fixed from year to year, independent of whether there was a rupture in a preceding year. The city has asked you determine the following

(a) The probability that next rupture will occur in the 3rd year.

(b) The expected number of years until the first rupture.

(c) The probability of exactly 2 ruptures in the next **10** years.

(d) The expected number of ruptures in the next **10** years.

(e) The probability that the first rupture occurs in one of the first three years

For each of the above questions note and defend any assumptions you make.

QUESTION 2 [4 marks]

The provincial governments are concerned with ruptures in towns (smaller than cities). For a certain category of town size (medium sized) the probability of a rupture within a single year is 0.005. Assume that in the province of Ontario there are 200 such towns, and let the random variable X represent the number of such towns experiencing a pipe rupture in a year. Calculate:

(a) The expected value for X

(b) The standard deviation for X

(c) The probability that 4 or more towns experience ruptures.

QUESTION 3 [13 marks] Regina Industries produces modular book case units. Demand in terms of the number of book-case units ordered in any one month varies between 300 and 800 units (as per the probability model shown below).

Demand (units/month)	Probability
300	0.10
500	0.30
600	0.45
800	0.15

Let X denote monthly demand

a. Please calculate expected value of X

b. Please calculate the standard deviation of X

c. Each modular unit requires 50 square-feet of wood. And standard practice involves ordering an **additional** 5000 square-feet per month (regardless of demand) as a contingency (spare wood in case there are production errors).

Note that you could compute a single exact value for RI's monthly wood order (MWO) if demand was exactly 300 units/month (one of the possibilities) but because demand is a random variable, MWO will also be a random variable.

i. Express the (MWO) mathematically as a function of demand (X)

MWO = _____

Determine the following for the random variable MWO

ii. Its expected value

iii. Its standard deviation

iv. Its coefficient of variation

d. If the price of wood is $2.50 per square foot determine the (i) expected value, (ii) standard deviation, and (iii) coefficient of variation for cost of purchasing the monthly wood supply.