A company produces a bundle of 20 USB sticks. Each USB stick is broken (i.e., malfunctioning) with probability 1/500, independently.

(a) Let \( Z \) be the number of broken USB sticks within one bundle. What is the distribution of \( Z \)? Also state the expectation and variance. [3 marks]

(b) Let \( p \) be the probability that there are at least two broken USB sticks in a bundle. Determine \( p \). [2 marks]

(c) Now let \( p \) be the probability that there are exactly five broken USB sticks in a bundle. Describe a suitable method for approximating the value of \( p \) and state the result. [3 marks]

(d) Consider a bundle of 20 sticks that has exactly 2 broken USB sticks. If someone takes out 3 different USB sticks chosen randomly, what is the probability that exactly one is broken? [3 marks]

(e) Suppose a retailer purchases a bundle and inspects each of the 20 USB sticks. If there are at least two broken USB sticks, the retailer asks the company for a new bundle which is delivered on the next day, and the process continues. What is the distribution of the number of days until the retailer has obtained a bundle with no broken USB sticks? Also state the expectation of that distribution. [3 marks]

Consider now two producers \( A \) and \( B \), each selling the same bundle but for different prices. For producer \( A \), the price is \( X \sim 2 + \text{Uni}(1, 2) \), and for producer \( B \), the price is \( Y \sim 3 + \text{Uni}(0, 1.5) \) (here \( \text{Uni}(a, b) \) refers to the uniform continuous random variable with range \([a, b]\)).

(f) What are \( E[X] \) and \( E[Y] \)? [2 marks]

(g) Assume that \( X \) and \( Y \) are independent random variables. What is \( P[X \leq Y] \)? (For full marks, complete your computation to obtain a specific numerical value.) [4 marks]