

**Q3 (5 marks): Binomial distribution**

A machine produces cells phone, and 6 percent of all cells produced can't pass a QC exam. What is the probability of having only 1 cell that pass audit in a randomly selected sample of 20 cells?

Response Q3



**Q4 (5 marks): Poisson distribution**

A product failure has historically averaged 2.7 occurrences per week.

- 4.1. What is the probability of 1 failures in a randomly selected week?
- 4.2. Represent the probability distribution ( $x$  from 1 to 3).

**Response Q 4**

**Note:**

- The sample mean:  $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$

- The range: Range =  $x_{\text{maximum}} - x_{\text{minimum}}$

- Sample Standard deviation:  $s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$

- Sample Variance:  $s^2$

- Coefficient of variation:  $CV = \left(\frac{s}{\bar{x}}\right) \cdot 100\%$

**Binomial distribution:**

$$P(X) = \frac{n!}{(n-X)! X!} \cdot (p)^X \cdot (q)^{n-X}$$

**Poisson distribution:**

$$P(X) = (e^{-\mu}) (\mu^X) / X!$$

**Geometric distribution:**

$$P(X = k) = q^{(k-1)} p, \text{ where } q = 1 - p$$

$$P(X > k) = q^k$$

$$E(X) = 1/p$$

$$\text{Var}(X) = q/p^2$$

**Q2 (5 marks)**

Let  $S = \{1,2,3,4,5,6,7,8,9,10\}$  ,  $A = \{2,4,6,8, 10\}$ ,  $B = \{1,3,5,7,9\}$ ,  $C = \{1,2,5,8,10\}$ .

List the elements of the sets corresponding to the following events:

2.1)  $A \cap B$

2.2)  $A \cup B$

2.3)  $A \cap C$

2.4)  $P(A \cap C)$

2.5)  $P(A \cap B)$

2.6)  $P(A|C)$

