CM 2130 - Statistical Distributions & Estimation
In- class examination – 2
Statistical Distributions

1). In the Growmore Market Garden plants are inspected for the presence of the deadly red angus leaf bug. The number of leaf bugs is known to follow a Poisson distribution with mean 1.
   a) Using the standard notation write down the corresponding distribution.
   b) Write down the corresponding pmf.
   c) Find correct to the 3 decimal places, the probability that at least one bug is found on any leaf of a given plant.

2).
   a) A cutting machine produces steel rods which must be not more than 100 cm in length. The mean length and the standard deviation of a large batch of rods taken from this cutting machine are found to be 99.80 cm and 0.15 cm respectively. Assuming the lengths of the rods are normally distributed find, correct to one decimal place, the **percentage** of rods which are too long.
   b) The position of the cut can be adjusted without altering the standard deviation of the length. Find in cm, correct to two decimal places, how small the mean length should be if 2% of the rods are to be rejected for being longer than 100 cm.
   c) If the mean length is maintained at 99.80 cm find to the nearest length of a **mm,** how much the standard deviation must be reduced if 4% of the rods are to be rejected for being longer than 100 cm.

3). The distribution function of the random variable X, the time (in months) from the diagnosis age until deaths for one population of AIDS patients, is as follows. (Hint- X follows an exponential distribution)

$$F_X(x) = 1 - e^{-0.03\times x^{1.2}}$$

   a) Find the probability that a randomly selected person from this population survives at least 1 year?
   b) Find the probability that a randomly selected person from this population survives at most 3 years?

4).
   i. In a large city 1 person out of 5 is left-handed. Find the probability that in a random sample of 10 people,
      a) Write down a suitable random variable.
      b) Identify the distribution and using the standard notation write down the distribution.
      c) Find the pmf.
      d) Exactly three will be left handed.
      e) More than half will be left handed.

ii. Assume there are 25 left- handed people in a random sample of 25. Find pmf, $E(X)$ and $V(X)$.

5). A randomly selected 8 weeks old baby smiles between zero and twenty three seconds. Assuming that this smiling time is uniformly distributed,

a) Find the probability that a randomly chosen baby smiles is in between two and eighteen seconds.

b) 90% of the smiling time falls below what value?