Probability and Statistics
Important questions for Minor – I

1. In a bolt factory, machines A, B and C manufactures respectively 20% , 30% and 50% of the total output. Of their outputs 5, 4 and 2 percent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by (i) Machine A (ii) Machine B?
2. A random variable X has the following probability function

Values of X, x	0	1	2	3	4	5	6	7
P(X=x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

   a) Find the value of k
   b) Evaluate: P(X<6), P(X>6) and P(O<X<5)
   c) Determine the cumulative distribution function of X
   d) Calculate the mean, variance and standard deviation of X

3. The total number of hours, measured in units of 100 hours, that a family runs a vacuum cleaner over a period of one year is a continuous random variable X that has the following density function:

$$f(x)=\begin{cases} x, & 0<x<1, \\ 2-x, & 1\le x<2, \\ 0, \textit{ else where} \end{cases}$$

   a) Find the probability that over a period of one year, a family runs their vacuum cleaner:
      i. Less than 120 hours
      ii. Between 50 and 100 hours
   b) Compute the mean, variance and standard deviation of the random variable X

4. fit a binomial distribution for the following data

X	0	1	2	3	4	5	6
F	13	25	52	58	32	16	4

5. For a normally distributed variate with mean 1 and standard deviation 3, find the probabilities that (i) $P(3.43 \le z \le 6.19)$ (ii) $P(-1.43 \le z \le 6.19)$

6. A population consists of numbers 2, 5, 7, 8. Consider all samples of size 2 which can be drawn with replacement from this population find. (i) the population mean (ii) the population standard deviation. (iii) the mean of sampling distribution means. (iv) the standard deviation of the sampling distribution of the means.
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8. A random sample of size 100 has a standard deviation of 5. What can you say about maximum error with 95% confidence?