**Probability and Statistics**

**Question Bank for Minor – I**

1. A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reason, all the three are used at varying times. In fact, Plans: 1, 2 and 3 are used for 30%, 20% and 50% of the products respectively. The defect rate is different for the three procedures and is: 0.01, 0.03 and 0.02 respectively. If a random product was observed and found to be defective, which plan was most likely used and thus responsible?
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 | k2 | 2k2 | 7k2+k |

1. Find the value of k
2. Evaluate: P(X<6), P(X>6) and P(O<X<5)

c) Calculate the mean, variance and standard deviation of X

# A continuous random variable has the probability density function

# 

# 0 , otherwise

determine (i) k (ii) mean (iii) variance

1. fit a binomial distribution for the following data

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

1. If a random variable has a poisson distribution such that P(1) = P(2), find the

(i) Mean of the distribution (ii) P (4) (iii) P( x≥ 4) (iv) P( 1 < x < 4)

1. In a normal distribution 7 % of the items are under 35 and 89% of the items are under 63. Determine the mean and variance of the distribution.
2. Given a standard normal distribution, find the value of k such that
   1. P (Z > k) = 0.2946;
   2. P (Z < k) = 0.0427;
   3. P (k < Z < −0.18) = 0.4197.
      1. P (−0.93 < Z < k) = 0.7235.
3. A population consists of 5 observations 2,3,6,8 and 11. Consider all samples of size 2 which can be drawn with and without replacement from this population find
4. The mean of the sampling distribution of means
5. The standard deviation of the sampling distribution of means.
6. What is the maximum error one can expect to make with probability 0.90 when using the mean of random sample of size n=64 to estimate the mean of population with variance 2.56.
7. Find 95 % confidence limits for the mean of a normality distributed population from

the following samples was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14.

1. Explain the procedure of test of significance of single mean – large samples.
2. An electrical firm manufactures light bulbs that have a lifetime that is approximately normally distributed with a mean of 800 hours and a standard deviation of 40 hours. Test the hypothesis that hours against the alternative hours, if a random sample of 30 bulbs has an average life of 788 hours. Use a 0.05 level of significance.