國立中央大學八十四學年度碩士班研究生入學試題卷

所別: 產業經濟研究所 甲組 科目: 統計學 共 1 頁 第 1 頁

參考用

1. (20%) The unknown proportion P, of smokers in a certain population is to be estimated by taking a sample of size n with replacement from the population. Let P_n' = the proportion of smokers in the sample. How large a sample should be taken in order to ensure that $P[|P_n' - P| < 0.005] \geq 0.95$? Use Chebyshev's inequality to answer this question.

2. (20%) In the above problem, use the normal approximation to find n. If the cost of the project is $1 per person in the sample, what is the approximate saving achieved by the normal approximation as compared with the method of problem 1?

3. (45%) T is the length of time that a certain machine operates without failure and R is the amount of time needed to repair a single failure. Assume that both variables have an exponential distribution with respective parameters 0.8 and 5, and that they are independent. Find:

(a) the probability of no failure in the next hour if the machine has just been repaired?

(b). the probability of no failure in the next 2 hours if you know that the machine was repaired 3 hours ago?

(c). the distribution of T = total time, excluding repairs, that the machine has been working during one hour if you know that it has failed twice and that it is working at the beginning of the next hour.

4. (15%) A point is moving rectilinearly with velocity $v(t) = 1/(t+1)$. Find the density function for the distance that the point has travelled in T minutes if T is a random variable uniform in (0, 1). Notice that the distance is the integral of the velocity.