STAT400. Final.

NAME:

STUDENT NUMBER:

SHOW ALL WORK!!! (No credit will be given for unjustified answers.)

(1) In a certain state 90 % of all congressmen use public finds for private expenses, 70 % cheat on taxes, 40 % have drug offenses, 68 % misuse public finds and cheat on taxes, 37 % misuse public funds and have drug offenses, 36 % cheat on taxes and have drug offenses, and 35 % commit all three crimes.

(a) What percentage of congressmen commit exactly two of the above mentioned crimes?

(b) Given a random tax cheater what is the probability that he also has a drug record?

(2) A resident of College Park, MD has 3.7 % probability that something would be stolen from them during each particular year. Jane plans to move to College Park and stay there 30 years (until her retirement). Let N be the number of times she would be a theft victim during her stay. Assuming that the theft rate is would remain the same and that different year crimes are independent

(a) Compute $E(N)$.

(b) Compute $V(N)$.

(c) Give a precise expression for the probability that $N = 2$.

(d) Use the tables provided to approximte the probability of part (c).

(3) Let X be a random variable with the following probability density

$$f(x) = \begin{cases} kx^2 & 0 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Find the value of k

(b) Find the commulative probability function.

(c) Find the median of X.

(d) Compute $P(X > 1)$.

(4) Among the vehicles crossing a certain bridge 70 % are cars, 20 % are trucks and 10 for truck – \$ 5 for bus \$ 10. Let R be a revenue collected from 1000 random cars.

(a) Comute $E(R)$.

(b) Compute $V(R)$.

(c) Compute the probability that $R > 2750$.

(d) How many cars should pass so that the probabilty that the revenue is at least \$ 5000 is 0.99?

(5) The following is a sample of intervals between calls to the customer service of a certain company.

1.30 0.79 1.94 0.52 0.38 0.43 0.61 0.52 0.98 0.11

(a) Compute the sample mean.

(b) Suppose that the intervals between the calls are independent and have exponential distributoin with unknown parameter λ. Use the sample to estimate λ.

(6) (a) For the sample of problem 5, give large sample confidence interval for the distribution mean with approximate confidence level of about 0.9.

(b) Estimate the number of observations needed to get a confidence interval of length 0.01.