Stat 345 – 002 Exam 2 April 4, 2006 Name:

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Be sure to show your work if you wish to receive credit. Normal Tables and blank scratch paper are on the end of the exam.

1. Let X be a normal random variable with $\mu = 15$ and $\sigma = 10$. a) Find P(X < 0)Find P(X > 40)b) Find x such that P(X > x) = 0.90c) Let X be a random variable with pdf $f(x) = \begin{cases} \frac{1}{9} & 1 < x < c \\ 0 & o.w. \end{cases}$. 2. a) Find c so that this is a proper pdf. b) Find E(X) and V(X)Find P(X < 2)c) 3. Use a normal approximation to obtain probabilities in the following problems. X is a binomial random variable with n = 400 and p = 0.25. Find P(X > 120). a) X is a Poisson random variable with a mean of 100. Find P(X > 120)b) X is a random variable with pdf $f(x) = \begin{cases} 0.5x - 1 & 2 < x < 4 \\ 0 & \text{o.w.} \end{cases}$. 4. a) Find P(2.5 < X < 3.5). b) Find the mean and variance of X. Find the cumulative distribution function of X. Be sure to define it over the entire real c) line The lifetime in years T of a personal computer CPU is a random variable with pdf 5. $f(t) = \begin{cases} \frac{1}{6}e^{-t/6} & x > 0\\ 0 & \text{o.w.} \end{cases}$ What is the chance a CPU lasts at least 3 years? a) b) Your company owns ten of these CPUs, and they fail independently. What is the chance that at least 2 of them fail within 3 years? 6. Flaws occur in the interior of a plastic used in automobiles according to a Poisson distribution with a mean of 0.02 flaws per panel. a) If 50 panels are inspected, what is the probability that there are no flaws? b) What is the expected number of panels that need to be inspected before a flaw is found? Think about this problem a minute before you answer – your first thought may be wrong. The question is about number of panels, not number of flaws. You probably want to start by computing the probability that a single panel has a flaw.

- 7. This is a continuation of problem 6.
 - a) If 50 panels are inspected, what is the probability that the number of panels with flaws is less than or equal to 2?
 - b) If there are 50 panels, 5 of which have flaws, and you randomly select 10 for inspection, what is the chance you find at least one with flaws?
- 8. In a manufacturing process that laminates several ceramic layers, 1% of the assemblies are defective. Assume that the assemblies are independent.
 - a) What is the mean number of assemblies that need to be checked to obtain five defective assemblies?
 - b) Determine the minimum number of assemblies that must be checked so that the probability of at least one defective assembly exceeds 0.95.