Stat 134, Fall 2014 # Midterm Exam **A. Adhikari**

Name:_____ **SID:** _____

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Time of section (circle one): 8 9 10 11 12 1 2 3 4 5

Show your work. Leave numerical answers unsimplified. You may use the normal c.d.f. Φ in your answers, but you must simplify any infinite sums.

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1. X and Y are independent random variables such that: $E(X) = 12$ $SD(X) = 4$ $E(Y) = 2$ $SD(Y) = 3$. Let $W = 3X - 7Y - 4$. Find $E(W)$ and $SD(W)$.

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2. In a large country, 60% of voters will vote in the next election. Approximately what is the chance that in a simple random sample of 300 voters, more than 200 will vote in the next election?

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3. A deck consists of 40 cards of which 9 are red. Cards are dealt at random without replacement until 3 red cards have appeared. Let X be the number of cards dealt. Find the distribution of X.

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4. X is a random variable with $E(X) = 3$ and $SD(X) = 2$.
True or false (justify your answer): $P(X^2 > 40) \leq 1/3$

5. There are n boxes and n balls; you can assume n is an integer greater than 3. Each ball is placed in a box picked uniformly at random, independently of the other balls. Let p_n be the probability that Box 1, Box 2, and Box 3 are all empty. Fill in the blanks (justify your answers):

$p_n =$ _____ $\lim_{n\to\infty} p_n =$ _____

6. A fair die is rolled 14 times. Let X be the number of faces that appear exactly 2 times. Find $E(X)$.

7. A fair die is rolled 14 times. Let X be the number of faces that appear exactly 2 times. Find $Var(X)$.

8. Let X_1 and X_2 be independent random variables such that for $i = 1, 2$, the distribution of X_i is Poisson (μ_i). Let m be a fixed positive integer. Find the distribution of X_1 given that $X_1 + X_2 = m$. Recognize this distribution as one of the famous ones, and provide its name and parameters.