Simulation and Modeling Mid Term exam Nov. 2014

Name: _____

ID Num: _____

Exam is in **Three** pages

1. (a) Let $X$ and $Y$ be independent and $E(X) = 5, E(Y) = -3, \sigma_X = 2, \sigma_Y = 3$, Find the mean and the standard deviation of:
$Z = 3X - 2Y - 2$

(b) Why do we prefer to use Pseudo random number in running experiments? and Why we need the Quasi random numbers?

2. Two friends A and B play a game by flipping a coin three times. If three heads come up, A wins 3 points and B wins zero points, if two heads and one tail, then A wins 2 points and B wins 1 point, etc. They played 80 rounds of that game and recorded the results: three heads appeared 6 times, two heads 22 times, one head 35 times, and zero heads 17 times. The friends suspected that the coin may not be really fair (the distribution is not uniform), as it lands on tails too often. They decided to verify their guess by using the $\chi^2$ test with a 10% significance level.
   (a) How many degrees of freedom in solving the problem
   (b) Given that the value of $\chi^2$ from the table is 6.25, check if the coin is fair or not Chi-Square test.

3. For a uniform random variable $X = U(0, 1)$, Compute the correlation between $X$ and $X^2$.

4. Determine which of the following LCGs have full period
   (a) $Z_i = (12Z_{i-1} + 13)(mod16)$
   (b) $Z_i = (Z_{i-1} + 12)(mod13)$
   (c) $Z_i = (13Z_{i-1} + 13)(mod16)$