CALIFORNIA STATE UNIVERSITY, EAST BAY
STATISTICS DEPARTMENT

Statistics 4870/6870 Bayesian Statistics
Summer 2007

Quiz 1 Take-home

1. **(take-home)** Write a WinBUGS program to implement the Bayesian estimation of the model in the previous problem. Start with the BetaBinomial code and use the WinBUGS density dnegbin(p,r). Compute the Bayesian estimates and posterior 95% credible intervals for p.

   (a) Suppose we flip a biased coin until the first success. Let X be the number of flips before the first success. Compute the Bayesian posterior estimate and 95% interval for p for $X = 12$.

   (b) Suppose we flip a biased coin until the fifth success. Let X now be the number of failures before the fifth success. Compute the Bayesian posterior estimate and 95% interval for p for $r = 5, X = 45$.

   (c) Repeat for $r = 10, X = 90$ and for $r = 100, x = 900$. Comment on the length of the posterior interval.

2. List all of the discrete probability models you know. Specify the parameters of the model, the probability mass function, the formula for the mean and variance of the model. (Make a copy of your list for use during the midterm.)

3. List all of the continuous probability models you know. Specify the parameters of the model, the probability density function, the formula for the mean and variance of the model. (Make a copy of your list for use during the midterm.)

4. For X a binomial random variable determine an appropriate prior on $\theta = P(success)$ and compute the posterior distributions of $\theta | X$.

5. For X a geometric random variable determine an appropriate prior on $\theta = P(success)$ and compute the posterior distributions of $\theta | X$.

6. For X a Poisson random variable determine an appropriate prior on λ and compute the posterior distributions of $\lambda | X$.

7. For X a normal random variable determine an appropriate prior on μ and compute the posterior distributions of $\mu | X$.