ISyE 6664 Exam # 2
Fall 2008

Name

Please be neat and show all your work so that I can give you partial credit.
GOOD LUCK.

Question 1
Question 2
Question 3
Question 4
    Total
1. (30) Consider a model with $S = \{s_1, s_2\}$, $A_{s_1} = \{a_{11}, a_{12}\}$, $A_{s_2} = \{a_{21}, a_{22}, a_{23}\}$, $p\{s_1|s_1, a_{11}\} = 1$, $p\{s_1|s_1, a_{12}\} = 0.5$, $p\{s_1|s_2, a_{21}\} = 1$, $p\{s_1|s_2, a_{22}\} = 0$ and $p\{s_1|s_2, a_{23}\} = 0.75$.

a. (10) Determine the chain structure of each deterministic stationary policy.

b. (15) Compute the gain and bias of each deterministic stationary policy.

c. (5) Is the optimal gain constant? If it is, why?
2. (25) Show that if all stationary deterministic policies are unichain, then all stationary randomized policies are unichain.
A repairman who services \( Q \) facilities moves between location \( s \) and location \( j \) according to the transition probability \( p(j|s) \). An equipment trailer which carries parts may be located at any one of \( M \) sites. If the trailer is at site \( m \) and the repairman is at facility \( j \), the cost of obtaining material from the trailer is \( c(m, j) \). The cost of moving the trailer from site \( m \) to \( j \) is \( d(m, j) \). The decision maker’s objective is to dynamically relocate the trailer so as to minimize the expected cost. Assume that the decision maker observes the location of the repairman and trailer, relocates the trailer and then the repairman moves and services a facility. Formulate this as an infinite horizon discounted Markov Decision Process problem. Does there exist a Markovian deterministic policy which is optimal? Justify your answer.
4. (25) Show that in a finite state model, $h_d$ is bounded whenever $r_d$ is bounded. Obtain a bound on $h_d$. 