Programming Assignment 5

Assigned: Nov. 19
Due: Dec. 3

Consider the same problem as in programming assignment 4, of a network with links that fail at random.

Part A

Write a function `MCProbConnected(E,P,PairA)` with the same functionality as the function `ProbConnected(E,P,PairA)` that you wrote for programming assignment 4, but which uses Monte Carlo search.

This is quite simple.

Choose some large value of N (e.g. 10,000; 1,000,000);
Count = 0;
for I = 1:N
    generate a random subgraph S of E by going through every edge in E and having it fail with probability P;
    if U and V are connected in S, then COUNT++;
end
return COUNT/N;

Part B

Write a function `ExpectedNumConnectedPairs(E,P)` that uses Monte Carlo search to compute the expected number of connected pairs.

This is much the same as in part A.

Choose some large value of N (e.g. 10,000; 1,000,000);
Total = 0;
for I = 1:N
    generate a random subgraph S of E by going through every edge in E and having it fail with probability P;
    Total = Total + the number of pairs connected in S;
end
return Total/N;

Part C

Consider a graph on 10 vertices that is just a straight line: A is connected to B, B is connected to A and C; C is connected to B and D; ... I is connected to H and J; J is connected to I.

With this graph, how many sample points are required to get an answer for part B accurate to within 1% for (a) P=0.1; (b) P=0.6? (Note that you can get the exact answer by using `NumConnectedPairs` from programming assignment 4.) Include your answer to this part as a comment in the code for Part B.