

## CS2223 HW#6

**DUE:** Tuesday, December 16

1. (6 points) A graph is an *Euler Graph* if it is connected and every vertex has even degree (has an even number of incident edges). Describe an algorithm to test if  $G = (V, E)$  is an Euler graph. Your algorithm should work in time in  $O(|V| + |E|)$ .
  
2. (10 points) For  $n \geq 1$ , the  $n$ -queens problem asks for  $Q(n)$ , the number of ways to place  $n$  nonattacking queens on an  $n \times n$  chessboard, where two queens attack each other if they are on the same row, column or diagonal. The URL <http://www.research.att.com/cgi-bin/access.cgi/as/njas/sequences/eisA.cgi?Anum=000170> shows the first few values of  $Q(n)$  to be:

$n$	$Q(n)$
1	1
2	0
3	0
4	2
5	10
6	4
7	40
8	92
9	352
10	724
11	2680
12	14200
13	73712
14	365596
15	2279184
16	14772512
17	95815104
18	666090624
19	4968057848
20	39029188884
21	314666222712
22	2691008701644
23	24233937684440

Write and test a probabilistic program to estimate  $Q(n)$  for arbitrary  $n$ . Show and discuss the results (accuracy and variance) of your tests.