Math 571
Spring 2006

Project 2

Instructions: This project is worth a total of 25 points. You may use any notes or books that you wish but you must work individually. The only computation aid which you may use is MATLAB, unless otherwise indicated. The primary reference for this project is the notes on graph theory which can be found at: `http://www.math.ohio-state.edu/ husen/teaching/571/graphs.pdf` Make sure to write clearly and justify your answers. WRITE ANY PROBABILITY AS A FRACTION, NOT AS A DECIMAL.

(1.)(5 pts.) Find a graph or digraph which has the given matrix as an adjacency matrix:

(a.) $\begin{pmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{pmatrix}$ **(b.)** $\begin{pmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{pmatrix}$

(2.)(10 pts.) For the graph in Figure 1, find:

(a.) The adjacency matrix of this graph,
(b.) The number of walks of length 6 from vertex 3 to vertex 4,
(c.) The number of walks of length at most 7 from vertex 5 to vertex 2,
(d.) The probability that a walk of length 8 starts at vertex 4 and ends at vertex 1,
(e.) The probability that a walk of length 6 which starts at vertex 1 will end at vertex 3.

(3.)(10 pts.) For the digraph in Figure 2, find:

(a.) The adjacency matrix of this digraph,
(b.) The number of walks of length 6 from vertex 1 to vertex 6,
(c.) The number of walks of length at most 8 from vertex 3 to vertex 2,
(d.) The probability that a walk of length 9 starts at vertex 6 and ends at vertex 2,
(e.) The probability that a walk of length 6 which starts at vertex 2 will end at vertex 4.

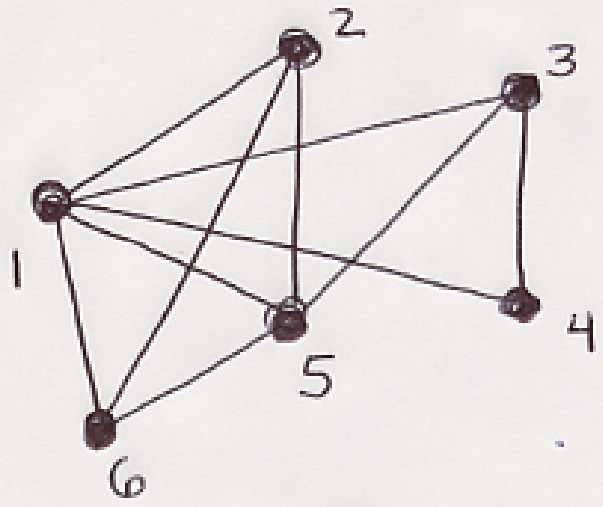

FIG. 1.

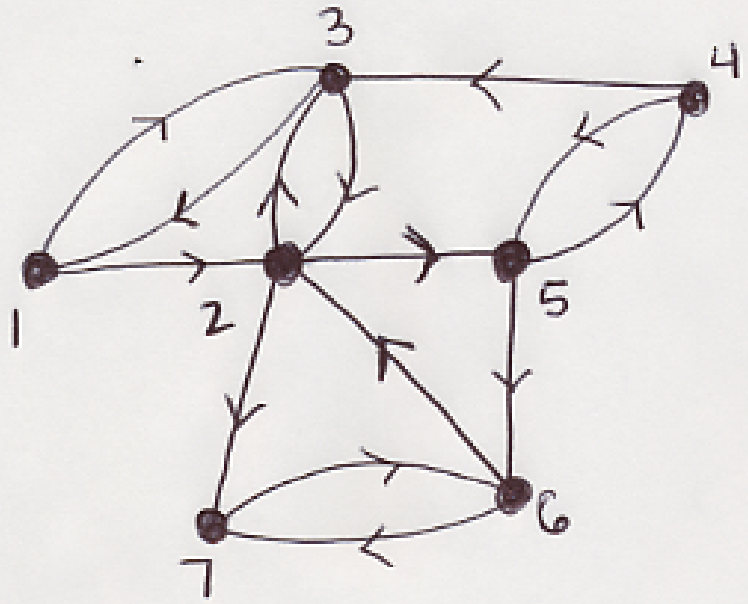

FIG. 2.