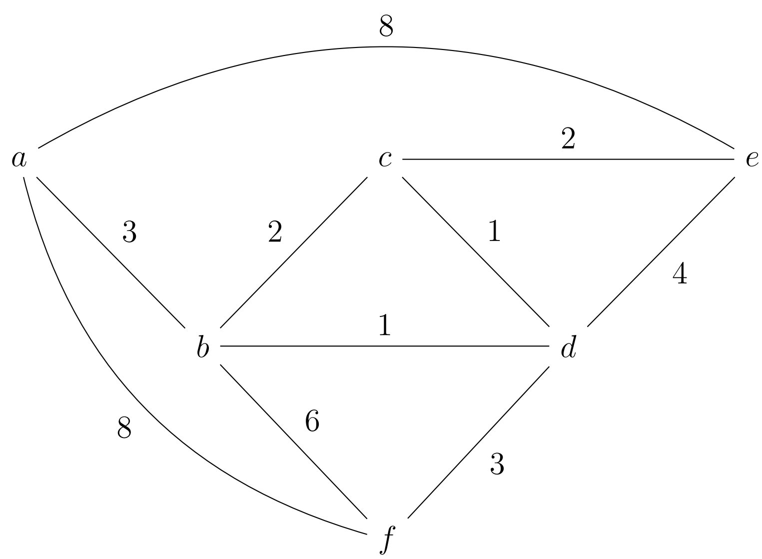
Practice: Floyd's Algorithm
Answer Key

CS236 - Discrete Structures
Instructor: Brett Decker
WINTER 2020 SECTION 2

Floyd's Algorithm: Practice

Consider the graph G (found below). Create the weighted adjacency matrix (order the vertices alphabetically). Now, compute Floyd's algorithm starting from that matrix. Create each subsequent matrix created at each iteration of the algorithm.



ANSWER:

$$F_0 = \begin{array}{c} \\ a \\ b \\ c \\ d \\ e \\ f \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & \infty & 8 & 8 \\ 3 & 0 & 2 & 1 & \infty & 6 \\ \infty & 2 & 0 & 1 & 2 & \infty \\ \infty & 1 & 1 & 0 & 4 & 3 \\ 8 & \infty & 2 & 4 & 0 & \infty \\ 8 & 6 & \infty & 3 & \infty & 0 \end{bmatrix} \end{array} \qquad F_1 = \begin{array}{c} \\ a \\ b \\ c \\ d \\ e \\ f \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & \infty & 8 & 8 \\ 3 & 0 & 2 & 1 & 11 & 6 \\ \infty & 2 & 0 & 1 & 2 & \infty \\ \infty & 1 & 1 & 0 & 4 & 3 \\ 8 & 11 & 2 & 4 & 0 & 16 \\ 8 & 6 & \infty & 3 & 16 & 0 \end{bmatrix} \end{array}$$

Legend: Blue - the i-th vertex we are working on; Yellow - other vertices connected through the i-th vertex; Red - new connections via the i-th vertex.

ANSWER:

$$F_2 = \begin{array}{c} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \\ f \end{array} \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & 5 & 4 & 8 & 8 \\ 3 & 0 & 2 & 1 & 11 & 6 \\ 5 & 2 & 0 & 1 & 2 & 8 \\ 4 & 1 & 1 & 0 & 4 & 3 \\ 8 & 11 & 2 & 4 & 0 & 16 \\ 8 & 6 & 8 & 3 & 16 & 0 \end{bmatrix} \end{array} \qquad F_3 = \begin{array}{c} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \\ f \end{array} \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & 5 & 4 & 7 & 8 \\ 3 & 0 & 2 & 1 & 4 & 6 \\ 5 & 2 & 0 & 1 & 2 & 8 \\ 4 & 1 & 1 & 0 & 3 & 3 \\ 7 & 4 & 2 & 3 & 0 & 10 \\ 8 & 6 & 8 & 3 & 10 & 0 \end{bmatrix} \end{array}$$

$$F_4 = \begin{array}{c} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \\ f \end{array} \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & 5 & 4 & 7 & 7 \\ 3 & 0 & 2 & 1 & 4 & 4 \\ 5 & 2 & 0 & 1 & 2 & 4 \\ 4 & 1 & 1 & 0 & 3 & 3 \\ 7 & 4 & 2 & 3 & 0 & 6 \\ 7 & 4 & 4 & 3 & 6 & 0 \end{bmatrix} \end{array} \qquad F_5 = \begin{array}{c} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \\ f \end{array} \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & 5 & 4 & 7 & 7 \\ 3 & 0 & 2 & 1 & 4 & 4 \\ 5 & 2 & 0 & 1 & 2 & 4 \\ 4 & 1 & 1 & 0 & 3 & 3 \\ 7 & 4 & 2 & 3 & 0 & 6 \\ 7 & 4 & 4 & 3 & 6 & 0 \end{bmatrix} \end{array}$$

$$F_6 = \begin{array}{c} \\ \begin{array}{c} a \\ b \\ c \\ d \\ e \\ f \end{array} \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & f \end{array} \\ \begin{bmatrix} 0 & 3 & 5 & 4 & 7 & 7 \\ 3 & 0 & 2 & 1 & 4 & 4 \\ 5 & 2 & 0 & 1 & 2 & 4 \\ 4 & 1 & 1 & 0 & 3 & 3 \\ 7 & 4 & 2 & 3 & 0 & 6 \\ 7 & 4 & 4 & 3 & 6 & 0 \end{bmatrix} \end{array}$$

Legend: Blue - the i-th vertex we are working on; Yellow - other vertices connected through the i-th vertex; Red - new connections via the i-th vertex.