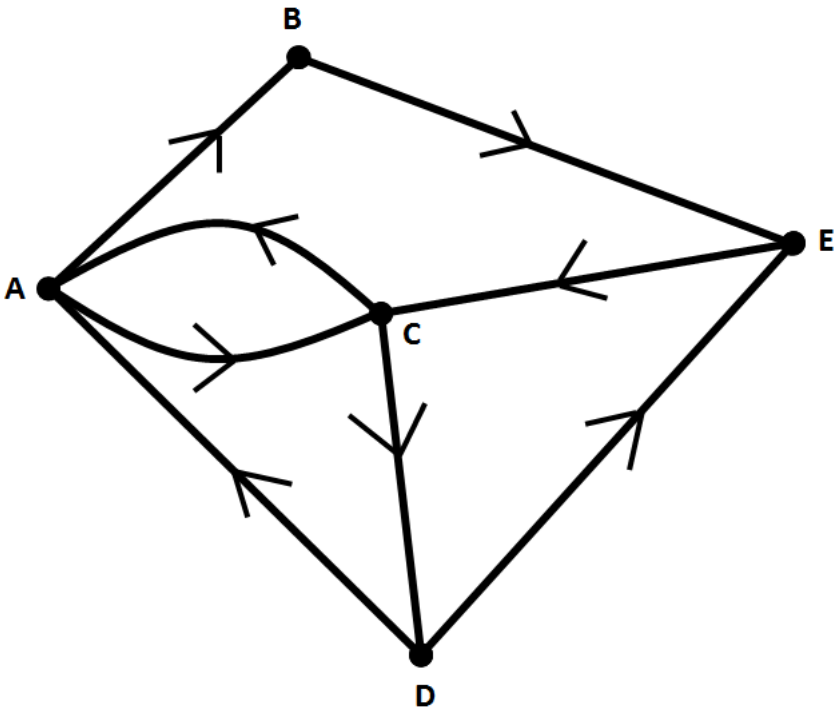
# GRAPH THEORY: DIRECTED GRAPHS (DIGRAPHS) [PIRNOT 4.3]

**EX 4.3.1:** Consider the following directed graph (digraph):




(a) Find a directed path from $A$ to $D$.

(b) Find a directed path of length 1 from $D$ to $A$.

(c) Find a directed path of length 2 from $D$ to $A$.

(d) Find a directed path of length 3 from $D$ to $A$.

(e) Find the corresponding incidence matrix to the digraph:

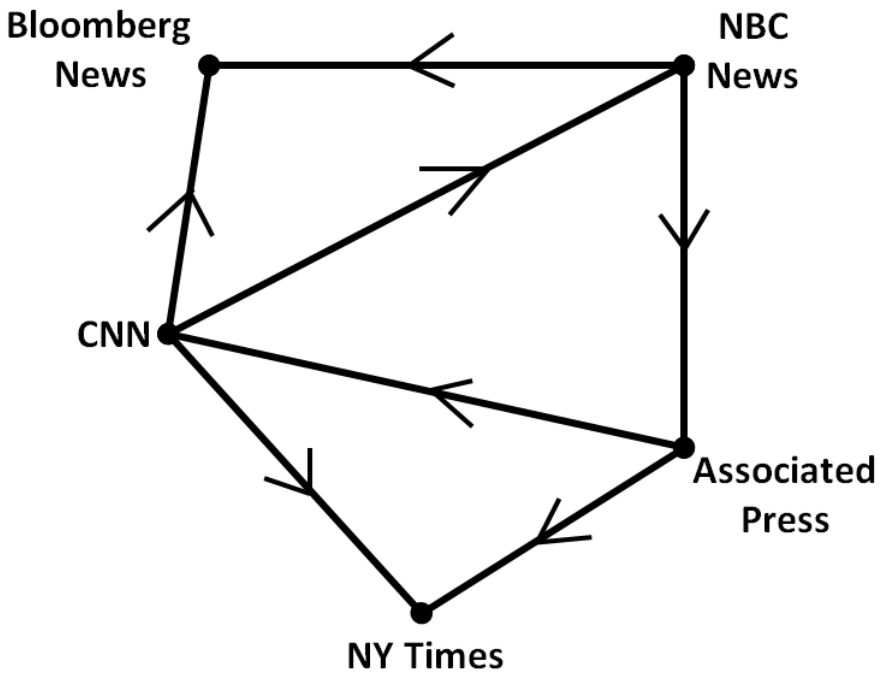
$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array} \begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \left[\begin{array}{ccccc} & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{array}\right] \end{array}$$

**EX 4.3.2:** Draw a directed graph (digraph) corresponding to the given incidence matrix:

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \\ F \end{array} \begin{array}{c} \begin{array}{cccccc} A & B & C & D & E & F \end{array} \\ \left[\begin{array}{cccccc} 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{array}\right] \end{array}$$

**EX 4.3.3:** Several news organizations have made public a secret government report.

Based on sources (which cannot be revealed), the given digraph indicates how the information could have passed among these organizations.




(a) Determine which organizations could have first obtained this information.

(b) Change the direction of only one edge in the digraph so that only CNN could have obtained the info first.