Calculate R vector and run Deadlock Detection Algorithm & Determine Deadlocks

$$Q = \begin{bmatrix} 3 & 0 & 4 & 2 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 2 & 4 & 2 \end{bmatrix}$$

$$A = \begin{bmatrix} 0 & 3 & 2 & 2 \\ 1 & 0 & 2 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$
$$+ \quad \overline{ 3 \quad 4 \quad 6 \quad 4}$$

$$V = \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix}$$

① **Find R**

$$V = R - A$$

$$R = V + A \text{ (sum of cols)}$$

$$R = \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix} + \begin{bmatrix} 3 & 4 & 6 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 5 & 6 & 4 \end{bmatrix} //$$

② **Run Algorithm To Find W**

$$\begin{array}{c}
P_1 \\ P_2 \\ P_3 \\ P_4
\end{array}
\begin{bmatrix} 3 & 0 & 4 & 2 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 2 & 4 & 2 \end{bmatrix}
\begin{array}{c} \le \\ \le \\ \le \\ \le \end{array}
\begin{array}{cccc|c}
0 & 1 & 0 & 0 & F \\
0 & 1 & 0 & 0 & F \\
0 & 1 & 0 & 0 & T \\
1 & 1 & 1 & 0 & F
\end{array}$$

$$\begin{array}{l}
[0\ 1\ 0\ 0] \\
+ [1\ 0\ 1\ 0] \\
\hline
1\ 1\ 1\ 0
\end{array}$$

Reiterate

$$\begin{array}{c}
P_1 \\ P_2 \\ P_4
\end{array}
\begin{bmatrix} 3 & 0 & 4 & 2 \\ 1 & 1 & 0 & 0 \\ 1 & 2 & 4 & 2 \end{bmatrix}
\begin{array}{c} \le \\ \le \\ \le \end{array}
\begin{array}{cccc|c}
1 & 1 & 1 & 0 & F \\
1 & 1 & 1 & 0 & T \\
2 & 1 & 3 & 0 & F
\end{array}$$

$$\begin{array}{l}
[1\ 1\ 1\ 0] \\
+ [1\ 0\ 2\ 0] \\
\hline
[2\ 1\ 3\ 0]
\end{array}$$

Final W = [2 1 3 0] //

Deadlocked Processes: P_1 and P_4 //