



$Q$  = Set of all states.

Start	$A_{03}$
Step 1: $\forall p \text{ in } Q,$ Add $A_{pp} \rightarrow \lambda$	$A_{00} \rightarrow \lambda$ $A_{11} \rightarrow \lambda$ $A_{22} \rightarrow \lambda$ $A_{33} \rightarrow \lambda$
Step 2: $\forall p, q, r \text{ in } Q,$ Add $A_{pr} \rightarrow A_{pq}A_{qr}$	$A_{00} \rightarrow A_{00}A_{00} \mid A_{01}A_{10} \mid A_{02}A_{20} \mid A_{03}A_{30}$ $A_{01} \rightarrow A_{00}A_{01} \mid A_{01}A_{11} \mid A_{02}A_{21} \mid A_{03}A_{31}$ $A_{02} \rightarrow A_{00}A_{02} \mid A_{01}A_{12} \mid A_{02}A_{22} \mid A_{03}A_{32}$ $A_{03} \rightarrow A_{00}A_{03} \mid A_{01}A_{13} \mid A_{02}A_{23} \mid A_{03}A_{33}$ $A_{10} \rightarrow A_{10}A_{00} \mid A_{11}A_{10} \mid A_{12}A_{20} \mid A_{13}A_{30}$ $A_{11} \rightarrow A_{10}A_{01} \mid A_{11}A_{11} \mid A_{12}A_{21} \mid A_{13}A_{31}$ $A_{12} \rightarrow A_{10}A_{02} \mid A_{11}A_{12} \mid A_{12}A_{22} \mid A_{13}A_{32}$ $A_{13} \rightarrow A_{10}A_{03} \mid A_{11}A_{13} \mid A_{12}A_{23} \mid A_{13}A_{33}$ $A_{20} \rightarrow A_{20}A_{00} \mid A_{21}A_{10} \mid A_{22}A_{20} \mid A_{23}A_{30}$ $A_{21} \rightarrow A_{20}A_{01} \mid A_{21}A_{11} \mid A_{22}A_{21} \mid A_{23}A_{31}$ $A_{22} \rightarrow A_{20}A_{02} \mid A_{21}A_{12} \mid A_{22}A_{22} \mid A_{23}A_{32}$ $A_{23} \rightarrow A_{20}A_{03} \mid A_{21}A_{13} \mid A_{22}A_{23} \mid A_{23}A_{33}$ $A_{30} \rightarrow A_{30}A_{00} \mid A_{31}A_{10} \mid A_{32}A_{20} \mid A_{33}A_{30}$ $A_{31} \rightarrow A_{30}A_{01} \mid A_{31}A_{11} \mid A_{32}A_{21} \mid A_{33}A_{31}$ $A_{32} \rightarrow A_{30}A_{02} \mid A_{31}A_{12} \mid A_{32}A_{22} \mid A_{33}A_{32}$ $A_{33} \rightarrow A_{30}A_{03} \mid A_{31}A_{13} \mid A_{32}A_{23} \mid A_{33}A_{33}$
Step 3: $\forall p, q, r, s \text{ in } Q,$ if $p \xrightarrow{a, \lambda \rightarrow U} r$ and $s \xrightarrow{b, U \rightarrow \lambda} q$ exist, Add $A_{pq} \rightarrow aA_{rs}b$	$A_{12} \rightarrow aA_{12}b \mid aA_{11}b \text{ (for } A)$ $A_{03} \rightarrow \lambda A_{11}\lambda \mid \lambda A_{12}\lambda \text{ (for } \$)$

Notation matches Sipser reading.