CDES/1/11

A workcell consists of two machines $M_1$ and $M_2$ and an automated guided vehicle $AGV$. $M_1$ is directly loaded by an infinite resource of raw material, but the $AGV$ has to move the workpiece from $M_1$ to $M_2$. The $AGV$ also has to move the completed workpiece from $M_2$ to an infinite output buffer. The machines and the $AGV$ are only able to keep one workpiece at a time.

1. Model the two machines and the $AGV$ with three separate automata.

2. Construct a model of the whole workcell by doing the parallel composition $P = M_1 \| M_2 \| AGV$.

3. Which states are not accessible in the parallel composition? What is the physical reason for that the states are not accessible?

4. Show that deadlock is possible in $P$. Construct a string that takes $P$ to a deadlock state. What is the physical interpretation of the deadlock?

5. What should be done in order to avoid the deadlock?