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Exercise 1

1. Finite Path Fragment: red, red/yellow, green
2. Infinite path fragment that is not a path: green, yellow, red, ...
3. Infinite path fragment that is a path: red, red/yellow, green...
4. No, there are no finite paths because there are no terminal states.

Exercise 2

1. $P = \{A_0 A_1 \ldots \in (2^{AP})^\omega \mid \forall i \geq 0 . \{red, green, yellow\} \nsubseteq A_i\}$

   $\square \neg (red \wedge green \wedge yellow)$

2. $P = \{A_0 A_1 \ldots \in (2^{AP})^\omega \mid \forall i \geq 0 \; \exists j \geq i . \; green \in A_j\}$

   $\square \Diamond green$

3. $P = \{A_0 A_1 \ldots \in (2^{AP})^\omega \mid \forall i \geq 0 . \; red \in A_i \Rightarrow green \notin A_{i+1}\}$

   $\square (red \Rightarrow \bigcirc \neg green)$

4. $P = \{A_0 A_1 \ldots \in (2^{AP})^\omega \mid \forall i \geq 0 \; \exists j > i . \; red \in A_i \Rightarrow green \in A_j\}$

   $\square (red \Rightarrow \Diamond green)$

5. $P = \{A_0 A_1 \ldots \in (2^{AP})^\omega \mid \exists i \geq 0 \; \forall j \geq i . \; red \in A_j \rightarrow yellow \in A_{j+1} \wedge green \in A_{j+2} \wedge red \in A_{j+3}\}$

   $\Diamond \square (red \Rightarrow \bigcirc yellow \Rightarrow \bigcirc green \Rightarrow \bigcirc red)$