$\sigma_A : \Omega_A \to \Omega_A$; $(\sigma_A(w))_i = w_{i+1}$

Definition. Let E be a metric space and $f: E \to E$. The map σ_A is said to be topologically semi-conjugate to f and $h: \Omega_A \to E$ is said to be a topological conjugacy, if h is continuous and surjective and

$$h(\sigma_A(w)) = f(h(w)), \text{ for any } w \in \Omega_A.$$

We denote this fact as $h \circ \sigma_A = f \circ h$.

You already know that transitivity of matrix A implies topologically mixing of σ_A.

Lemma 1. Let σ_A be topologically semi-conjugate to f and h be a conjugacy. If σ_A is topologically mixing then so is f.

Proof. What does topological mixing of σ_A mean?
for any two nonempty open sets $U, V \subset \Omega_A$ there exists n_0 such that
$$(\sigma_A)^n(U) \cap V \neq \emptyset \text{ for every } n > n_0.$$

Assume the contrary.
$\Rightarrow \exists (\text{open } \hat{U}, \hat{V} \subset E) \forall (\hat{n}_0 \in \mathbb{N}) \exists (n > n_0) [f^n(\hat{U}) \cap \hat{V} = \emptyset]$

By surjectivity : $\boxed{\exists u_0, v_0 : h(u_0) \subset \hat{U},\ h(v_0) \subset \hat{V}.}$

By continuity : $\exists U, V : h(U) \subset \hat{U},\ h(V) \subset \hat{V}$.

$f^n(h(U)) \cap h(V) = \emptyset$

$\boxed{f^n(h(U)) = f^{n-1}(f(h(U))) = f^{n-1}(h(\sigma_A(U))) = f^{n-2} h \sigma_A^2(U)}$

$$h((\sigma_A)^n(U)) \cap h(V) = \emptyset$$

$$\boxed{h(A) \cap h(B) \supset h(A \cap B)}$$

$$h((\sigma_A)^{n_k}(U) \cap V) = \emptyset \quad , \quad \text{where } n_k \to \infty \text{ as } k \to \infty$$

You already know that topologically mixing map on a space with more than one point has sensitive dependence on initial conditions.

Therefore, in the settings of Lemma 1, if A is transitive, than f has sensitive dependence on initial conditions.