$(\Omega, \mathcal{F}, P) = (\mathbb{R}^N, \mathcal{B}^N, P)$.

From Kolmogorov's extension procedure,

$$\mathcal{B}^N = \sigma(\{A_n : n = 1, 2, \dots\})$$

$$A_n = B_1 \times B_2 \times \cdots \times B_n \times \mathbb{R} \times \mathbb{R} \times \cdots, \quad B_i \in \mathcal{B}.$$

Thus, for $\forall A \in \mathcal{B}^N$, $\exists A_n$ s.t.

$$A_1 \supseteq A_2 \supseteq A_3 \cdots \to A_n.$$

$$TA = A \Rightarrow T^n A = A.$$

$$T^n A = \{(w_n, w_{n+1}, \dots) : w \in A\}$$

$$= \{(X_n, X_{n+1}, \dots)(w) : w \in A\}$$

$$A = \{(w_0, w_1, \dots) : w \in A\} = \{(X_0, X_1, \dots)(w) : w \in A\}$$

$$A_n = \{(w_0, w_1, \dots) : w \in B_0 \times B_2 \times \cdots \times B_n \times \mathbb{R} \times \mathbb{R} \cdots\}$$

$$\boxed{\cancel{= \{(X_0, X_1, \dots)(w) : w \in B_1 \times B_2 \times \cdots \times B_n \times \mathbb{R} \times \mathbb{R} \cdots\}}}$$

$$= \{(w_0, w_1, \dots, w_n) \in B_0 \times B_2 \cdots \times B_n\}$$

$$= \{(X_0, X_1, \dots, X_n)(w) \in B_0 \times B_2 \times \cdots \times B_n\}$$

$$P(A) = P(A \cap T^{n+1} A) = \lim_{n \to \infty} P(A_n \cap T^{n+1} A)$$

$$= \lim_{n \to \infty} P\big(\{(X_0, X_1, \dots, X_n)(w) \in B_0 \times \cdots \times B_n\} \cap \{(X_{n+1}, X_{n+2}, \dots)(w) : w \in A\}\big)$$

$$= \lim_{n \to \infty} P(\{(X_0, X_1, \dots, X_n)(w) \in B_0 \times \cdots \times B_n\}) \times P(\{(X_{n+1}, X_{n+2}, \dots)(w) : w \in A\})$$

$$= \lim_{n \to \infty} P(A_n) P(A) = P^2(A) \Rightarrow P(A) = 0 \text{ or } 1.$$