Random Walk Algorithms: Bonus Problem

Consider a random walk $\{D_t \mid t \in \mathbb{N}\}$ on the set $\{0, 1, \ldots, n\}$ defined by the transition probability matrix with entries:

$$P_{ij} = \begin{cases} 1 & \text{if } j = n \text{ and } i = j - 1; \\ p & \text{if } 0 < j < n \text{ and } i = j - 1; \\ 1 - p & \text{if } 0 < j < n \text{ and } i = j + 1; \\ 1 & \text{if } j = 0 \text{ and } i = j; \\ 0 & \text{otherwise.} \end{cases}$$

Let

$$T_d = \min_{t \geq 0} \{D_t = 0 \mid D_0 = d\}.$$

How does $\mathsf{E}[T_d]$ depend on n and d for $p = 1/2$? For $p > 1/2$? For $p < 1/2$?