I will try to prove that the following states are reachable in your example:

(a) $2^{n-1}$ subsets all of which contains state 0,

(b) $2^{n-k-1} - 1$ nonempty subsets of $\{1, 2, ..., n - k - 1\}$.

If we prove (a), then (b) is easy because
if $1 <= i_1 < i_2 < ... < i_t <= n - k - 1$, then we have

$\{0, i_2 - i_1, ..., i_t - i_1\}$ by $a^{i_1}$ to $\{i_1, i_2, ..., i_t\}$.

So, let us show (a).

By induction on the size of subsets.

$\{0\}$ is reachable form $q_0'$ by $\epsilon$. Next,

$\{0\}$ by $a^{n-1}$ to $\{0, n - 1\}$ by $a$ to $\{0, 1\}$

$\{0, n - 1\}$ by $b$ to $\{0, 2\}$ by $b$ to $\{0, 3\}$ ... by $b$ to $\{0, n - 2\}$.

So, all subsets containong 0 of size 1 and 2 are reachable. Let $2 <= t <= n-1$ and suppose, any subset containing 0 of size t is reachable. Using this, prove that any subset

$\{0, i_1, i_2, ..., i_t\}$ where $1 <= i_1 < i_2 < ... < i_t <= n - 1$
of size t+1 is reachable.

(i) First, let $i_t = n - 1$. Then the subset $\{0, i_2 - i_1, ..., i_{t-1} - i_1, (n - 1) - i_1\}$ of size $t$ is reachable by induction and

$\{0, i_2 - i_1, ..., i_{t-1} - i_1, (n - 1) - i_1\}$ by $a^{i_1}$ to $\{0, i_1, i_2, ..., i_{t-1}, n - 1\}$,
so any subset $\{0, i_1, i_2, ..., i_{t-1}, n - 1\}$ is reachable.

(ii) Now, let $i_1 = 1$ or $i_1 = 2$. Then we have

$\{0, 1, i_2, ..., i_t\} <\!\!\text{——}\ a\ \text{——}\ \{0, i_2 - 1, ..., i_t - 1, n - 1\}$

$\{0, 2, i_2, ..., i_t\} <\!\!\text{——}\ b\ \text{——}\ \{0, i_2 - 1, ..., i_t - 1, n - 1\}$

where the set on the right is considered in case (i).

(iii) Finally, let $i_1 > 2$. Then we have

$\{0, i_1, i_2, ..., i_t\} < \text{——}\ b^{i_1 - 2}\ \text{——}\ \{0, 2, i_2 - i_1 + 2, ..., i_t - i_1 + 2\}$

where the latter set is considered in case (ii).