If $L = \{0^m 1^n \mid n = m^2,\ m, n \in$ N is a context-free language then L has a "pumping length" P such that any string S may be divided into 5 pieces, $S = uvxyz$ where $|S| \geq P$ [0] and following conditions must be true:

uv^ixy^iz is in L for every $i \geq 0$ [1],
$|vy| \geq 1$ [2],
$|vxy| \leq P$ [3]

[2], [3] indicates that $P \geq 1$ with [0] which indicates $m \geq 1$ then $|S| \geq 2$

case 1: vxy contains only either of the letters {0, 1}

case 1a: vxy contains only 0s

This indicates $|z| \geq 1$ and for all $i > 1$ [1] fails as the number of 1s stays *constant* while the number of 0s increase

case 1b: vxy contains only 1s

Similar to 1a $|u| \geq 1$ and for all $i > 1$ [1] fails as the number of 0s stays constant while the number of 1s increase

case 2: vxy contains both 0s and 1s

case 2ab: v or y contains both 0s and 1s

This case fails as it produces some 1s before 0s when pumped using [1] which then fails [1] as eg. 0000010101…. Fails to be in L

case 2c: v contains only 0s and y contains only 1s

This case fails since the number of 1s depends on the number of 0s *exponentially* whereas the pumping production of [1] 0s and 1s are done *linearly*. This will cause [1] to fail again for all $i > 1$ as both v and y are being pumped up based on i, whereas y needs to be pumped up by i^2 to satisfy the language grammar.

Since all the cases have at least one outlier for some P and/ or i , L is not a context-free language.