The now familiar back-substitution is:

$$
\begin{aligned}
cN^k &= T(N) - \text{ł}T(N/b) \\
&= [DN^k + KN^k \log_b(N)] \\
&\qquad - \text{ł}[D(N/b)^k + K(N/b)^k \log_b(N/b))] \\
&= DN^k[1-(\text{ł}/b^k)] \\
&\qquad + KN^k[\log_b(N)-(\text{ł}/b^k)\{\log_b(N)-\log_b(b)\}] \\
&= 0 + KN^k[\log_b(N)-1\{\log_b(N)-1\}] = KN^k
\end{aligned}
$$

Thus, the constant $K=c$: the original $c>0$ of the problem statement. Therefore $cN^k\log_b(N)$ is the dominant term in $T(N) = DN^k + KN^k\log_b(N)$, so

$T(N)$ is $\Theta(N^k\log_b(N))$ when $\text{ł} = b^k$.

Summary: *(c.f. page 135 of Brassard & Bratley)*

when we have $T(N) = \text{ł}T(N/b) + cN^k$, $\forall\ N > N_0$; $\text{ł}\in Z$, $b\in Z$; $\text{ł} \geq 1$, $b \geq 1$, $c\in\Re$, $k\in\Re$; $c\geq 0$, $k\geq 0$, and $T:\mathbf{Z}^+\to\Re^+$ non-decreasing, then

$T(N) = AN^{\log_b(\text{ł})} + BN^k$ is $\Theta(N^k)$ when $\text{ł} < b^k$

$T(N) = DN^k + KN^k\log_b(N)$ is $\Theta(N^k\log_b(N))$ when $\text{ł} = b^k$

$T(N) = AN^{\log_b(\text{ł})} + BN^k$ is $\Theta(N^{\log_b(\text{ł})})$ when $\text{ł} > b^k$