Asymptotic properties of solutions to fourth-order difference equations on time scales

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We provide sufficient criteria for the existence of solutions for fourth-order nonlinear dynamic equations on time scales

$$\left(a(t)x^{\Delta^2}(t)\right)^{\Delta^2} = b(t)f\left(x(t)\right) + c(t),$$

such that for a given function $y\colon \mathbb{T} \to \mathbb{R}$ there exists a solution $x\colon \mathbb{T} \to \mathbb{R}$ to considered equation with asymptotic behaviour $x(t) = y(t) + o\left(\frac{1}{t^\beta}\right)$. The presented result is applied to the study of solutions to the classical Euler-Bernoulli beam equation, which means that it covers the case $\mathbb{T} = \mathbb{R}$.

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