is

$$k\partial_k\Gamma_k = \frac{1}{2}Tr[(\Gamma_k^{(2)} + \mathcal{R}_k)^{-1}k\partial_k\mathcal{R}_k] \tag{1}$$

where Γ_k integrates out all the fluctuations at scale k and connects the admissible fundamental action at $\Gamma_{k\to\infty} = S$ to the conventional effective action at $\Gamma_{k\to 0} = \Gamma$. This average–like effective action at tree–level describes all gravitational phenomena for each momentum of order k [11]. Indeed, the IR–cutoff $\mathcal{R}_k(p^2)$ which appears in the definition of Γ_k, eliminates the effects of fluctuations of $p^2 < k^2$ on RG flow and is defined by an arbitrary smooth function $\mathcal{R}_k(p^2) \propto k^2\mathcal{R}^{(0)}(\frac{p^2}{k^2})$ where $\mathcal{R}^{(0)}(\psi)$ satisfies the conditions $\mathcal{R}^{(0)}(0) = 1$ and $\mathcal{R}^{(0)}(\psi \to \infty) \to 0$. The exponential form $\mathcal{R}^{(0)}(\psi) = \frac{\psi}{\exp(\psi)-1}$ is a common chosen form in the literatures [12]. Since the multiplicity of couplings in the effective action makes the β-function intricate, truncation would project the RG flow into the finite dimensional subspace spanned by the essential couplings. This method gives a finite number of ordinary differential equations.

The Enistein–Hilbert truncation,

$$\Gamma_k[g_{\alpha\beta}] = \frac{1}{16\pi G_k}\int d^4x\sqrt{g}(-R(g) + 2\Lambda_k) \tag{2}$$

is a common truncation for cosmological models.

It is shown numerically in [13] that for the small values of cutoff $k \to 0$, at *perturbative regime*, the solutions of β-functions for this model lead to the following power–series dimensionful couplings

$$G(k) = G_0\left[1 - \omega G_0 k^2 + \mathcal{O}(G_0^2 k^4)\right] \tag{3}$$

$$\Lambda(k) = \Lambda_0 + \nu G_0 k^4\left[1 + \mathcal{O}(G_0 k^2)\right] \tag{4}$$

where $\omega = \frac{1}{6\pi}[24\Phi_2^2(0) - \Phi_1^1(0)]$, $\nu = \frac{1}{4\pi}\Phi_2^1(0)$ and $\Phi_n^p(w)$ is the threshold function, which depends on the IR–cutoff as:

$$\Phi_n^p(w) = \frac{1}{\Gamma(n)}\int \psi^{n-1}\frac{\mathcal{R}^{(0)}(\psi) - \psi\mathcal{R}^{(0)'}(\psi)}{[\psi + \mathcal{R}^{(0)}(\psi) + w]^p}d\psi$$