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A Cosmological Model for the Inflationary Universe (Using New Boundary Conditions).

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In 1997 it is showed that the Universe is expanding with an acceleration. Many models have been employed to explain this incident. Use of the variable cosmological parameter was proposed by Hemantha and de Silva (2003) & (2004). They wrote modified field equations in the form

$R^{\mu\nu} - \frac{1}{2}\bar{R}g^{\mu\nu} = \kappa T^{\mu\nu} - \Lambda g^{\mu\nu}$, where $\kappa = \frac{-8\pi G}{c^2}$

We obtain a solution $R = k + d\sqrt{(1 - cos^3 \alpha t)}$ for above equations. This model represents the inflationary universe with deceleration, acceleration and again deceleration. This model also obey for the big bang model.

The unknowns k, d, α can be found under the specific boundary conditions. According to the big bang, at the beginning of the universe the radius of the Universe is zero (this is our first boundary condition), so we can get $k = 0$.

In the literature it is found that the onset of acceleration took place at red shift is in between $1.2 - 1.6$. At that time $\ddot{R} = 0$.We take 1.4 for redshift and take the age of the Universe as 13.7 billion years (this is our second boundary condition) and $1.4 = \sqrt{(1 - cos^3 \alpha t)}$ and calculate

$\alpha = 6.94 \times 10^{-18}\ rads^{-1}$.

To evaluate d we consider the ratio $\frac{\Lambda'}{\rho} = \frac{7}{3}$ $\quad (\Lambda' = \frac{\Lambda c^2}{8\pi G}$ Λ is the cosmological constant)

We get $d = 6.14 \times 10^{27}\ cm$

Finally, we obtain the Radius of the Universe and the density of the Universe at the present epoch and discuss the behavior of the radius of the Universe against the cosmic time.

Radius of the Universe at present epoch $R = 8.5732 \times 10^{27}\ cm$.

Density of the Universe at present epoch $\rho = 4.8153 \times 10^{-26}\ gcm^{-3}$.

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