INTISARI

STUDI AWAL TENTANG GRAVITASI-$f(R)$ SINGULER

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Telah dikaji perumusan teori gravitasi-$f(R)$ dalam keragaman semi-Riemannan singuler. Persamaan medan gravitasi-$f(R)$ singuler diperoleh melalui pendekatan prinsip variasi. Besaran-besaran yang terlibat dalam perumusan tersebut merupakan besaran-besaran yang licin sekalipun pada kasus metrik merosot. Persamaan medan yang diperoleh merupakan persamaan medan yang diperluas hingga titik singularitas ruang-waktu. Dikonsruksi pula perluasan persamaan Friedmann termodifikasi-$f(R)$ yang terdefinisi pada singularitas *big-bang*. Besaran tensor energi-momentum umum $T_{\mu\nu}\sqrt{-g}$, rapat massa (energi) umum $\tilde{\rho}$, dan rapat tekanan umum $\tilde{P}$, tetap licin sekalipun pada titik singularitas. Ditinjau pula singularitas ruang-waktu pada lubang hitam Schwarzschild termodifikasi-$f(R)$. Dengan melakukan alih-ragam koordinat, diperoleh wakilan metrik semi-reguler yang analitik pada singularitas $r = 0$.

Kata-kata kunci: keragaman semi-Riemannan singuler, persamaan medan, singularitas ruang-waktu.

ABSTRACT

PRELIMINARY STUDY ON SINGULAR $f(R)$-GRAVITY

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The formulation of $f(R)$-gravity theory on singular semi-Riemannian manifolds has been studied. The Field equations can be obtained via variational principle approach. The quantities which is involved in the formulation is a smooth quantity even when the metric becames degenerate. The field equations is an extended field equations through singularities. Extended Friedmann equations through bigbang singularity has also been obtained. The quantities such as generalized energy-momentum tensor $T_{\mu\nu}\sqrt{-g}$, generalized mass (energy) density $\tilde{\rho}$, and generalized pressure density $\tilde{P}$, is smooth even at singularities. Spacetime singularity in modified-$f(R)$ Schwarzschild black holes has also been considered. By coordinate transformation, the metric which is semi-regular and analytic that includes singularity $r = 0$ has been obtained.

Keywords : singular semi-Riemannian manifolds, field equations, spacetime singularity.