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A Well Behaved Exact Solution for Spherically Symmetric Perfect Fluid Ball

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Dedicated to Prof. Hari M. Srivastava on his 75^{th} ***birth anniversary***

Abstract: We here present a spherically symmetric exact solution of the general relativistic field equations by using Tewari [1] solution as a seed solution. The solution is having positive finite central pressure and positive finite central density. The ratio of pressure and density is less than one and casualty condition is obeyed at the centre. Further, the outmarch of pressure, density and pressure-density ratio, and the ratio of sound speed to light is monotonically decreasing. The central red shift and surface red shift are positive and monotonically decreasing. Further by assuming the suitable surface density, we have constructed a compact star model with all degree of suitability.

Keywords: Exact solution, Einsteins field equations, Perfect fluid ball, Compact star.

1. Introduction:

Due to condensation and thereafter contraction of a massive gas cloud (mass less than the solar mass) a quasi static equilibrium state is reached when a resulting thermal radiation pressure together with normal hydrodynamic pressure balances the gravitational binding energy which ends up into a compact stellar object. Einstein's field equation was obtained by Schwarzschild for the interior of this static compact stellar object. The well behaved solution of Einstein's field equation can give us an idea about the interiors of massive fluid ball. The first ever two exact solution of Einstein field equation for a compact object in static equilibrium was obtained by Schwarzschild [2]. The first solution corresponds to the geometry of the space-time exterior to a static prefect fluid ball, while the other solution describes the interior geometry of a fluid sphere of constant energy-density. Tolman [3] has