Bharatiya Vidya Mandir's
BHARATIYA MAHAVIDYALAYA, AMRAVATI
Arts, Commerce, Science & H.S.C. Vocational
(NAAC Re-accredited B++ Grade with CGPA - 2.95)

Dr. Aradhana G. Vaidya
M.A. (Eng.) Ph.D.
Principal

Ref. No. Bmv/MoU 5839A

Date : 26.07.2021

LETTER OF COLLABORATION/MoU

BETWEEN

P.R. Pote Patil College of Engineering & Management Amravati & Bharatiya Mahavidyalaya, Amravati

We the "Parties" Listed Above, Intend to develop a Collaborative Partnership based upon the following areas of Corporation and subject mutual consent.

1. Exchange of Faculty Experts guest Lecture
2. Exchange of Academic materials and other information
3. Special Short Term Programs
4. Exchange of Students Experts guest Lecture
5. Research Activities

The Parties desire to undertake this collaboration to build on existing relationship and/or form new relationship in order to implement excellence in academic programs offering by the P.R.Pote (Patil) College of Engineering and Management Amravati.

Each Institution will designate an individual to coordinates this Program and all endeavors that may derive from it. For this Purpose **P.R.Pote (Patil) College of Engineering and Management Amravati**. Designates (Dr. D.T. Ingole Principal) and **Bharatiya Mahavidyalaya Amravati** Designates Dr. Meena V. Dawande Prof. & Head of Mathematics Department.

The term of this Letter of Collaboration for three years from **20th July 2021 to 19th July 2024.**

Either Party may terminate this LOC without cause upon at least thirty (30) Days prior written notice to other Party Signed by appropriate official of the institution initiating the notice.

For P.R.Pote (Patil) College of Engineering & Management Amravati

Name: Dr. D. T. Ingole
Designation: Principal
Date:

for Bharatiya Mahavidylaya Amravati

Name: Dr. A. G. Vaidya
Designation: Principal,
Date: Bharatiya Mahavidyalay, Amravati.

Address : Rajapeth, Badnera Road, Amravati - 444605
Contact : Off. 2673283, 2575033, Fax. : 0721 - 2566801, Mob.9823030091
E-mail : bmvamt@gmail.com Website : www.bmvamt.ac.in

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Dark Energy Bianchi Type-III Cosmological Models in $f(T)$ Theory of Gravity

S.S. Nerkar*, **M.V. Dawande**

Department of Mathematics, Bharatiya Mahavidyalaya,
Sant Gadge Baba Amravati University, Amravati, 444602, India
*Corresponding author E-mail: sheetalnerkar03@gmail.com

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Abstract. In this paper, we have considered spatially homogeneous and anisotropic Bianchi type-III universe in the context of $f(T)$ theory of gravity. Here, we have reconstructed Bianchi type-III cosmological models using continuity equation and equation of state parameter which represent different phases of universe. We have considered matter dominated era, radiation dominated era and dark energy phase along with their combinations. It has been observed that one of the models has constant solution which may correspond to cosmological constant. We have also derived equation of state parameter by using well known $f(T)$ models and described cosmic acceleration.

KEY WORDS: $f(T)$ gravity, Bianchi typeIII universe, continuity equation.

1 Introduction

The concept of accelerated expansion of universe put forward by Supernova type-Ia experiment has revolutionized modern cosmology [1, 2]. There are two representative approaches to explain this acceleration. The first is that universe is fluid by an exotic fluid with negative pressure called Dark Energy (DE) generally materialized by the cosmological constant within General Relativity (GR). The second is modifying the gravitational action and so, explanations can be done about the acceleration of the expansion of the universe. There have been several investigations on this way within theories essential based on the curvature scalar [3–6].

One of the most popular modified gravity theory which is obtained by modifying Einstein–Hilbert (EH) action by replacing Ricci curvature scalar R with an $f(R)$ function, which is an arbitrary function of R, is called $F(R)$ theory of gravity [7–12]. It was observed that the late time acceleration of universe can be explained within this modified theory [13]. Interesting result are obtained with

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Exponential and Logarithmic Expansion of Bianchi Type-III Cosmological Models in $f(T)$ Gravity

S.S. Khan*, M.V. Dawande

P.R. Pote (Patil) College of Engineering and Management, Amravati, Maharashtra, India;
*Corresponding author E-mail: simisadaf84@rediffmail.com

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Abstract. The main motive of this paper is to study the Bianchi Type-III cosmological model in the context of $f(T)$ gravity. We construct some $f(T)$ models for expalning the evolutionary behavior of equation of state parameter $\omega_{\rm DE}$ and energy density $\rho_{\rm DE}^{(*)}$. These parameters are calculated in terms of $|T/T_0|$ and redshift z. To solve the field equations of the theory we have used hybrid expansion law which shows a transition from decelerated phase to an accelerated phase in $f(T)$ theory gravity. We discuss these cosmological parameters graphically by taking different values of redshift and EoS parameter. The crossing of phantom divide line can be seen in exponential and combined $f(T)$ models whereas it can not be seen in logarithmic models.

KEY WORDS: Bianchi type III Universe, $f(T)$ theory of gravity, Equation of state parameter, Hybrid expansion law.

1 Introduction

The present Universe is dominated by two dark components containing dark matter (DM) and dark energy (DE) suggests the Type Ia Supernovae observational data. A matter without pressure, which is mainly used to explain galactic curves and large scale structure formation, is know as dark matter, whereas an exotic energy with negative pressure, is used to explain the present cosmic accelerating expansion is known as a dark energy. One of the greatest cosmological and astronomical problem of the 21st century is to understand the origin and nature of dark matter and dark energy. Recently, there are two main ways for the discussion of this accelerated expansion. One way is to introduce scalar fields models in Einstein gravity like phantom [1, 2], quintessence [3–5] and anisotropic fluids [6, 7] etc.

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Phantom behavior of Bianchi Type-III cosmological models in $f(T)$ gravity

S. S. Khan[1] ,M.V. Dawande[2]

[1]Department of Mathematics, Bhartiya Mahavidyalaya, Amravati, Sant Gadge Baba Amravati University, India. 444605.

[2]Department of Mathematics, Bhartiya Mahavidyalaya, Amravati, Sant Gadge Baba Amravati University, India. 444605.

E-mail:simisadaf84@rediffmail.com, minapatankar@gmail.com

Abstract:

The behavior of equation of state parameter and energy density for dark energy in $f(T)$ gravity has been investigated. Here we propose two $f(T)$ models and observe transition between phantom and non-phantom phase.

Keywords: Bianchi type III Universe, $f(T)$ theory of gravity, Equation of state parameter, Hybrid expansion law.

[1] Introduction:

One of the greatest cosmological mysteries till today is the origin of structure in the universe. At large scale, the universe is homogeneous and isotropic and it is in accelerating phase suggests the current day observations (Gasperini 2003). Despite the success of general relativity, the interest in theories beyond it, generically known as 'modified gravity' theories has grown substantially in recent decades.

Amongst the modified theories, $f(R)$ theory of gravity has been extensively investigated by many authors (Capozzilello *et al.* 2005; Nojiri *et al.* 2006; Nojiri and Odintsov 2007). The $f(R)$ gravity is also considered to be helpful in describing the evolution of the universe. It is the modification of general theory of relativity which is proposed by Einstein. $f(R)$ theory was first proposed by Buchdahl in 1970. The $f(R)$ theory of gravity provides a very natural unification of the early time inflation and late time acceleration. The presence of late time cosmic acceleration of the universe in $f(R)$ gravity was explained by Carroll *et al.* (2004). Generalization of $f(R)$ gravity is $f(R,T)$ gravity which is developed by Harko *et al.* (2011). This theory is based upon the coupling of matter and geometry. Several problems have been considered by multiple authors in the $f(R,T)$ theory of gravity (Sharif and