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New form Lagrangian Dynamics on the standard 10- Kahler Manifolds

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Abstract: *In this study, we concluded the Lagrangian Dynamics on standard 10- Kahler, being a model. Finally introduce, some geometrical and physical results on the related mechanic systems have been discussed.*
Key word: *configuration manifold, Lagrangian function, 10-Kahler Manifolds- Lagrangian mechanics.*

I. Introduction

Lagrange's equations are one of the most important topics in differential geometry .So, if $\mathcal{M}$ is an m-dimensional configuration manifold and $\mathrm{L} : \mathrm{T}\mathcal{M} \to \mathrm{R}$ is a regular Lagrangian function, then there is a unique vector field X on $T\mathcal{M}$ such that dynamic equations are determined by

$$i_X \phi_L = dE_L \tag{1}$$

where ϕ indicates the symplectic form. The triple $(T\mathcal{M}, \phi_L, L)$ is called Lagrangian system on the tangent bundle $T\mathcal{M}$.
there are many studies about Lagrangian mechanics, formalisms, systems and equations such that real.

It is the most important studies on the subject of paper is a study entitled (Lagrangian Dynamics on the standard 10- Kahler Manifolds)
) .Get some of them four Kahler analogue Lagrangian Mechanics. Some of the findings related to multi-compound Kahler was also certain dynamical systems[1].

The paper is structured as follows. In second 2, we review 10n- manifolds. In second 3 we introduce Lagrangian equations for dynamical systems on 10n- manifold .In conclusion, we discuss some geometric-physical results about Lagrangian equations and fields constructed on the base manifold.

II. 10- Kahler Manifolds

Let $\mathcal{M}$ be a real smooth manifold of dimension m. Suppose that there is a 8-dimensional vector bundle V consisting of $\mathrm{G_i}(\mathrm{i} = \overline{1,8})$ tensors of type (1,1) over $\mathcal{M}$. Such a local basis $\{\mathrm{G_1}, \mathrm{G_2}, \mathrm{G_3}, \mathrm{G_4}, \mathrm{G_5}, \mathrm{G_6}, \mathrm{G_7}, \mathrm{G_8}\}$ is named a canonical local basis of the bundle .
If for any canonical basis $\{\mathrm{G_1}\}, i = \overline{1,8}$ of U in a coordinate neighborhood U, the identities
$f(\mathrm{G_i}X, \mathrm{G_i}Y) = f(X, Y), \forall X, Y \in \mathrm{X}(\mathcal{M}), i = 1, 2, \dots, 8,$
hold, the triple $(\mathcal{M}, f, U)$ is called an almost 10n-Kahler manifold or metric 10n-Kahler manifold denoting by U an almost 10n-Kahler manifold structure U and by g a Riemannian metric and by (f, U) an almost 10n-Kahler manifold metric structure.
Suppose that let

$$\{x_i, x_{n+i}, x_{2n+i}, x_{3n+i}, x_{4n+i}, x_{5n+i}, x_{6n+i}, x_{7n+i}, x_{8n+i}, x_{9n+i}\}, \mathrm{i} = \overline{1,\mathrm{n}}$$

be a real coordinate system on $(\mathcal{M}, U)$. Then we denote by

$$\left\{\frac{\partial}{\partial x_i}, \frac{\partial}{\partial x_{n+i}}, \frac{\partial}{\partial x_{2n+i}}, \frac{\partial}{\partial x_{3n+i}}, \frac{\partial}{\partial x_{4n+i}}, \frac{\partial}{\partial x_{5n+i}}, \frac{\partial}{\partial x_{6n+i}}, \frac{\partial}{\partial x_{7n+i}}, \frac{\partial}{\partial x_{8n+i}}, \frac{\partial}{\partial x_{9n+i}}\right\}$$

$$\{dx_i, dx_{n+i}, dx_{2n+i}, dx_{3n+i}, dx_{4n+i}, dx_{5n+i}, dx_{6n+i}, dx_{7n+i}, dx_{8n+i}, , dx_{9n+i}\}$$

the natural bases over R of the tangent space $T(\mathcal{M})$ and the cotangent space $T^*\mathcal{M}$ of $\mathcal{M}$ respectively. By structures $\{\mathrm{G_1}, \mathrm{G_2}, \mathrm{G_3}, \mathrm{G_4}, \mathrm{G_5}, \mathrm{G_6}, \mathrm{G_7}, \mathrm{G_8}\}$ } the following expressions are given

$$G_1\left(\frac{\partial}{\partial x_i}\right) = \frac{\partial}{\partial x_{n+i}} \quad G_2\left(\frac{\partial}{\partial x_i}\right) = \frac{\partial}{\partial x_{2n+i}} \quad G_3\left(\frac{\partial}{\partial x_i}\right) = \frac{\partial}{\partial x_{3n+i}} \quad G_4\left(\frac{\partial}{\partial x_i}\right) = \frac{\partial}{\partial x_{4n+i}}$$

$$G_1\left(\frac{\partial}{\partial x_{n+i}}\right) = \frac{\partial}{\partial x_i} \quad G_2\left(\frac{\partial}{\partial x_{n+i}}\right) = \frac{\partial}{\partial x_{3n+i}} \quad G_3\left(\frac{\partial}{\partial x_{n+i}}\right) = \frac{\partial}{\partial x_{8n+i}} \quad G_4\left(\frac{\partial}{\partial x_{n+i}}\right) = \frac{\partial}{\partial x_{6n+i}}$$

$$G_1\left(\frac{\partial}{\partial x_{2n+i}}\right) = \frac{\partial}{\partial x_{5n+i}} \quad G_2\left(\frac{\partial}{\partial x_{2n+i}}\right) = \frac{\partial}{\partial x_i} \quad G_3\left(\frac{\partial}{\partial x_{2n+i}}\right) = \frac{\partial}{\partial x_{4n+i}} \quad G_4\left(\frac{\partial}{\partial x_{2n+i}}\right) = \frac{\partial}{\partial x_{7n+i}}$$

$$G_1\left(\frac{\partial}{\partial x_{3n+i}}\right) = \frac{\partial}{\partial x_{6n+i}} \quad G_2\left(\frac{\partial}{\partial x_{3n+i}}\right) = \frac{\partial}{\partial x_{n+i}} \quad G_3\left(\frac{\partial}{\partial x_{3n+i}}\right) = \frac{\partial}{\partial x_i} \quad G_4\left(\frac{\partial}{\partial x_{3n+i}}\right) = \frac{\partial}{\partial x_{8n+i}}$$

$$G_1\left(\frac{\partial}{\partial x_{4n+i}}\right) = \frac{\partial}{\partial x_{7n+i}} \quad G_2\left(\frac{\partial}{\partial x_{4n+i}}\right) = \frac{\partial}{\partial x_{5n+i}} \quad G_3\left(\frac{\partial}{\partial x_{4n+i}}\right) = \frac{\partial}{\partial x_{2n+i}} \quad G_4\left(\frac{\partial}{\partial x_{4n+i}}\right) = \frac{\partial}{\partial x_i}$$

$$G_1\left(\frac{\partial}{\partial x_{5n+i}}\right)=\frac{\partial}{\partial x_{2n+i}}\quad G_2\left(\frac{\partial}{\partial x_{5n+i}}\right)=\frac{\partial}{\partial x_{4n+i}}\quad G_3\left(\frac{\partial}{\partial x_{5n+i}}\right)=\frac{\partial}{\partial x_{7n+i}}\quad G_4\left(\frac{\partial}{\partial x_{5n+i}}\right)=\frac{\partial}{\partial x_{9n+i}}$$
$$G_1\left(\frac{\partial}{\partial x_{6n+i}}\right)=\frac{\partial}{\partial x_{3n+i}}\quad G_2\left(\frac{\partial}{\partial x_{6n+i}}\right)=\frac{\partial}{\partial x_{8n+i}}\quad G_3\left(\frac{\partial}{\partial x_{6n+i}}\right)=\frac{\partial}{\partial x_{9n+i}}\quad G_4\left(\frac{\partial}{\partial x_{6n+i}}\right)=\frac{\partial}{\partial x_{n+i}}$$
$$G_1\left(\frac{\partial}{\partial x_{7n+i}}\right)=\frac{\partial}{\partial x_{4n+i}}\quad G_2\left(\frac{\partial}{\partial x_{7n+i}}\right)=\frac{\partial}{\partial x_{9n+i}}\quad G_3\left(\frac{\partial}{\partial x_{7n+i}}\right)=\frac{\partial}{\partial x_{5n+i}}\quad G_4\left(\frac{\partial}{\partial x_{7n+i}}\right)=\frac{\partial}{\partial x_{3n+i}}$$
$$G_1\left(\frac{\partial}{\partial x_{8n+i}}\right)=\frac{\partial}{\partial x_{9n+i}}\quad G_2\left(\frac{\partial}{\partial x_{8n+i}}\right)=\frac{\partial}{\partial x_{6n+i}}\quad G_3\left(\frac{\partial}{\partial x_{8n+i}}\right)=\frac{\partial}{\partial x_{n+i}}\quad G_4\left(\frac{\partial}{\partial x_{8n+i}}\right)=\frac{\partial}{\partial x_{3n+i}}$$
$$G_1\left(\frac{\partial}{\partial x_{9n+i}}\right)=\frac{\partial}{\partial x_{8n+i}}\quad G_2\left(\frac{\partial}{\partial x_{9n+i}}\right)=\frac{\partial}{\partial x_{7n+i}}\quad G_3\left(\frac{\partial}{\partial x_{9n+i}}\right)=\frac{\partial}{\partial x_{6n+i}}\quad G_4\left(\frac{\partial}{\partial x_{9n+i}}\right)=\frac{\partial}{\partial x_{5n+i}}$$

III. Lagrangian Dynamical

Using classical mechanics on the standard 10n-Kahler manifold (R^{10n},U) Liouville form and a 1-form on the standard 10n-Kahler manifold (R^{10n},U) are shown by G_i respectively.

First :

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{n+i}}\right)+\frac{\partial L}{\partial x_i}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_i}\right)-\frac{\partial L}{\partial x_{n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{5n+i}}\right)+\frac{\partial L}{\partial x_{2n+i}}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{6n+i}}\right)+\frac{\partial L}{\partial x_{3n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{7n+i}}\right)+\frac{\partial L}{\partial x_{4n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{2n+i}}\right)-\frac{\partial L}{\partial x_{5n+i}}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{3n+i}}\right)-\frac{\partial L}{\partial x_{6n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{4n+i}}\right)-\frac{\partial L}{\partial x_{7n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{9n+i}}\right)+\frac{\partial L}{\partial x_{8n+i}}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{8n+i}}\right)-\frac{\partial L}{\partial x_{9n+i}}=0 \qquad (5)$$

Second :

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_i}\right)+\frac{\partial L}{\partial x_{2n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{n+i}}\right)+\frac{\partial L}{\partial x_{3n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{2n+i}}\right)-\frac{\partial L}{\partial x_i}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{3n+i}}\right)-\frac{\partial L}{\partial x_{n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{4n+i}}\right)+\frac{\partial L}{\partial x_{5n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{5n+i}}\right)-\frac{\partial L}{\partial x_{4n+i}}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{6n+i}}\right)-\frac{\partial L}{\partial x_{8n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{7n+i}}\right)+\frac{\partial L}{\partial x_{9n+i}}=0\ ,\quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{8n+i}}\right)+\frac{\partial L}{\partial x_{6n+i}}=0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{9n+i}}\right)-\frac{\partial L}{\partial x_{7n+i}}=0 \qquad (8)$$

Third:

$$\lambda=X^i\frac{\partial}{\partial x_i}+X^{n+i}\frac{\partial}{\partial x_{n+i}}+X^{2n+i}\frac{\partial}{\partial x_{2n+i}}+X^{3n+i}\frac{\partial}{\partial x_{3n+i}}+X^{4n+i}\frac{\partial}{\partial x_{4n+i}}+X^{5n+i}\frac{\partial}{\partial x_{5n+i}}+X^{6n+i}\frac{\partial}{\partial x_{6n+i}}$$
$$+X^{7n+i}\frac{\partial}{\partial x_{7n+i}}+X^{8n+i}\frac{\partial}{\partial x_{8n+i}}+X^{9n+i}\frac{\partial}{\partial x_{9n+i}} \qquad (2)$$

let (R^{10n},U). be a 10- Kahler manifold. Suppose that an element of almost 10- Kahler structure U, a Liouville form and a 1-form on 10- Kahler manifold (R^{10n},U) are denoted by G_3 , respectively.
Let vector field λ determined by

$$U=G_3(\lambda)=X^i\frac{\partial}{\partial x_{3n+i}}+X^{n+i}\frac{\partial}{\partial x_{8n+i}}+X^{2n+i}\frac{\partial}{\partial x_{4n+i}}-X^{3n+i}\frac{\partial}{\partial x_i}+X^{4n+i}\frac{\partial}{\partial x_{2n+i}}+X^{5n+i}\frac{\partial}{\partial x_{7n+i}}$$
$$+X^{6n+i}\frac{\partial}{\partial x_{9n+i}}-X^{7n+i}\frac{\partial}{\partial x_{5n+i}}-X^{8n+i}\frac{\partial}{\partial x_{n+i}}-X^{9n+i}\frac{\partial}{\partial x_{6n+i}}$$

is called Liouville vector field on the standard 10-Kahler manifold

Is vertical derivation (differentiation) d_{G_2} is defined

$$d_{G_3}=\left[i_{G_3},d\right]=i_{G_3}d-di_{G_3}$$

3.1 Definition

The Lagrangian function
Kinetic energy given $T: R^{10n}\to R$ such that

$$T=\frac{1}{2}m_i(\dot{x}_i^2+\dot{x}_{n+i}^2+\dot{x}_{2n+i}^2+\dot{x}_{3n+i}^2+\dot{x}_{4n+i}^2+\dot{x}_{5n+i}^2+\dot{x}_{6n+i}^2+\dot{x}_{7n+i}^2+\dot{x}_{8n+i}^2+\dot{x}_{9n+i}^2)$$

Potential energy $P: R^{10n}\to R$ such that

$$P=m_igh$$
$$m_i=mass\quad and\quad h=stand\quad ,\quad g=gravity\ acceleration$$

The Lagrangian function $L: R^{10n}\to R$ is map that satisfies the condition then

$$L = T - P$$

$\theta_L^{G_3} L = -dd_{G_3} L$ such that

$d_{G_3} L = G_3(\lambda) = \left(X^i \frac{\partial}{\partial x_{3n+i}} + X^{n+i} \frac{\partial}{\partial x_{8n+i}} + X^{2n+i} \frac{\partial}{\partial x_{4n+i}} - X^{3n+i} \frac{\partial}{\partial x_i} + X^{4n+i} \frac{\partial}{\partial x_{2n+i}} + \right.$
X5n+i∂∂x7n+i+X6n+i∂∂x9n+i−X7n+i∂∂x5n+i−X8n+i∂∂xn+i−X9n+i∂∂x6n+iL

$$d_{G_3} L = G_3(\lambda) = \left(X^i \frac{\partial L}{\partial x_{3n+i}} + X^{n+i} \frac{\partial L}{\partial x_{8n+i}} + X^{2n+i} \frac{\partial L}{\partial x_{4n+i}} - X^{3n+i} \frac{\partial L}{\partial x_i} + X^{4n+i} \frac{\partial L}{\partial x_{2n+i}} + X^{5n+i} \frac{\partial L}{\partial x_{7n+i}} + X^{6n+i} \frac{\partial L}{\partial x_{9n+i}} - X^{7n+i} \frac{\partial L}{\partial x_{5n+i}} - X^{8n+i} \frac{\partial L}{\partial x_{n+i}} - X^{9n+i} \frac{\partial L}{\partial x_{6n+i}}\right)$$

$$\theta_L^{G_3} L = -dd_{G_3} L = -d\left(\frac{\partial L}{\partial x_{3n+i}} dx_i + \frac{\partial L}{\partial x_{8n+i}} dx_{n+i} + \frac{\partial L}{\partial x_{4n+i}} dx_{2n+i} - \frac{\partial L}{\partial x_i} dx_{3n+i} - \frac{\partial L}{\partial x_{2n+i}} dx_{4n+i} + \frac{\partial L}{\partial x_{7n+i}} dx_{5n+i} + \frac{\partial L}{\partial x_{9n+i}} dx_{6n+i} - \frac{\partial L}{\partial x_{5n+i}} dx_{7n+i} - \frac{\partial L}{\partial x_{n+i}} dx_{8n+i} - \frac{\partial L}{\partial x_{6n+i}} dx_{9n+i}\right)$$

Defined by operator

$$d_{G_3}: A(R^{10n}) \to \Lambda^1 R^{10n}$$

Then

$$\begin{aligned}
\theta_L^{G_3} L = &-\frac{\partial^2 L}{\partial x_j \partial x_{3n+i}} dx_j \wedge dx_i - \frac{\partial L}{\partial x_j \partial x_{8n+i}} dx_j \wedge dx_{n+i} - \frac{\partial L}{\partial x_j \partial x_{4n+i}} dx_j \wedge dx_{2n+i} + \frac{\partial L}{\partial x_j \partial x_i} dx_j \wedge dx_{3n+i} \\
&+ \frac{\partial L}{\partial x_j \partial x_{2n+i}} dx_j \wedge dx_{4n+i} - \frac{\partial L}{\partial x_j \partial x_{7n+i}} dx_j \wedge dx_{5n+i} - \frac{\partial L}{\partial x_j \partial x_{9n+i}} dx_j \wedge dx_{6n+i} \\
&+ \frac{\partial L}{\partial x_j \partial x_{5n+i}} dx_j \wedge dx_{7n+i} + \frac{\partial L}{\partial x_j \partial x_{n+i}} dx_j \wedge dx_{8n+i} + \frac{\partial L}{\partial x_j \partial x_{6n+i}} dx_j \wedge dx_{9n+i} \\
&- \frac{\partial^2 L}{\partial x_{n+j} \partial x_{3n+i}} dx_{n+j} \wedge dx_i - \frac{\partial L}{\partial x_{n+j} \partial x_{8n+i}} dx_{n+j} \wedge dx_{n+i} - \frac{\partial L}{\partial x_{n+j} \partial x_{4n+i}} dx_{n+j} \wedge dx_{2n+i} \\
&+ \frac{\partial L}{\partial x_{n+j} \partial x_i} dx_{n+j} \wedge dx_{3n+i} + \frac{\partial L}{\partial x_{n+j} \partial x_{2n+i}} dx_{n+j} \wedge dx_{4n+i} - \frac{\partial L}{\partial x_{n+j} \partial x_{7n+i}} dx_{n+j} \wedge dx_{5n+i} \\
&- \frac{\partial L}{\partial x_{n+j} \partial x_{9n+i}} dx_{n+j} \wedge dx_{6n+i} + \frac{\partial L}{\partial x_{n+j} \partial x_{5n+i}} dx_{n+j} \wedge dx_{7n+i} + \frac{\partial L}{\partial x_{n+j} \partial x_{n+i}} dx_{n+j} \wedge dx_{8n+i} \\
&+ \frac{\partial L}{\partial x_{n+j} \partial x_{6n+i}} dx_{n+j} \wedge dx_{9n+i} \\
&- \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{3n+i}} dx_{2n+j} \wedge dx_i - \frac{\partial L}{\partial x_{2n+j} \partial x_{8n+i}} dx_{2n+j} \wedge dx_{n+i} - \frac{\partial L}{\partial x_{2n+j} \partial x_{4n+i}} dx_{2n+j} \wedge dx_{2n+i} \\
&+ \frac{\partial L}{\partial x_{2n+j} \partial x_i} dx_{2n+j} \wedge dx_{3n+i} + \frac{\partial L}{\partial x_{2n+j} \partial x_{2n+i}} dx_{2n+j} \wedge dx_{4n+i} \\
&- \frac{\partial L}{\partial x_{2n+j} \partial x_{7n+i}} dx_{2n+j} \wedge dx_{5n+i} - \frac{\partial L}{\partial x_{2n+j} \partial x_{9n+i}} dx_{2n+j} \wedge dx_{6n+i} \\
&+ \frac{\partial L}{\partial x_{2n+j} \partial x_{5n+i}} dx_{2n+j} \wedge dx_{7n+i} + \frac{\partial L}{\partial x_{2n+j} \partial x_{n+i}} dx_{2n+j} \wedge dx_{8n+i} \\
&+ \frac{\partial L}{\partial x_{2n+j} \partial x_{6n+i}} dx_{2n+j} \wedge dx_{9n+i} \\
&- \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{3n+i}} dx_{3n+j} \wedge dx_i - \frac{\partial L}{\partial x_{3n+j} \partial x_{8n+i}} dx_{3n+j} \wedge dx_{n+i} - \frac{\partial L}{\partial x_{3n+j} \partial x_{4n+i}} dx_{3n+j} \wedge dx_{2n+i} \\
&+ \frac{\partial L}{\partial x_{3n+j} \partial x_i} dx_{3n+j} \wedge dx_{3n+i} + \frac{\partial L}{\partial x_{3n+j} \partial x_{2n+i}} dx_{3n+j} \wedge dx_{4n+i} \\
&- \frac{\partial L}{\partial x_{3n+j} \partial x_{7n+i}} dx_{3n+j} \wedge dx_{5n+i} - \frac{\partial L}{\partial x_{3n+j} \partial x_{9n+i}} dx_{3n+j} \wedge dx_{6n+i} \\
&+ \frac{\partial L}{\partial x_{3n+j} \partial x_{5n+i}} dx_{3n+j} \wedge dx_{7n+i} + \frac{\partial L}{\partial x_{3n+j} \partial x_{n+i}} dx_{3n+j} \wedge dx_{8n+i} \\
&+ \frac{\partial L}{\partial x_{3n+j} \partial x_{6n+i}} dx_{3n+j} \wedge dx_{9n+i}
\end{aligned}$$

$$-\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{3n+i}}dx_{4n+j}\wedge dx_i-\frac{\partial L}{\partial x_{4n+j}\partial x_{8n+i}}dx_{4n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{4n+j}\partial x_{4n+i}}dx_{4n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{4n+j}\partial x_i}dx_{4n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{4n+j}\partial x_{2n+i}}dx_{4n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{4n+j}\partial x_{7n+i}}dx_{4n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{4n+j}\partial x_{9n+i}}dx_{4n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{4n+j}\partial x_{5n+i}}dx_{4n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{4n+j}\partial x_{n+i}}dx_{4n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{4n+j}\partial x_{6n+i}}dx_{4n+j}\wedge dx_{9n+i}$$
$$-\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{3n+i}}dx_{5n+j}\wedge dx_i-\frac{\partial L}{\partial x_{5n+j}\partial x_{8n+i}}dx_{5n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{5n+j}\partial x_{4n+i}}dx_{5n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{5n+j}\partial x_i}dx_{5n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{5n+j}\partial x_{2n+i}}dx_{5n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{5n+j}\partial x_{7n+i}}dx_{5n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{5n+j}\partial x_{9n+i}}dx_{5n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{5n+j}\partial x_{5n+i}}dx_{5n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{5n+j}\partial x_{n+i}}dx_{5n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{5n+j}\partial x_{6n+i}}dx_{5n+j}\wedge dx_{9n+i}$$
$$-\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{3n+i}}dx_{6n+j}\wedge dx_i-\frac{\partial L}{\partial x_{6n+j}\partial x_{8n+i}}dx_{6n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{6n+j}\partial x_{4n+i}}dx_{6n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{6n+j}\partial x_i}dx_{6n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{6n+j}\partial x_{2n+i}}dx_{6n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{6n+j}\partial x_{7n+i}}dx_{6n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{6n+j}\partial x_{9n+i}}dx_{6n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{6n+j}\partial x_{5n+i}}dx_{6n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{6n+j}\partial x_{n+i}}dx_{6n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{6n+j}\partial x_{6n+i}}dx_{6n+j}\wedge dx_{9n+i}$$
$$-\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{3n+i}}dx_{7n+j}\wedge dx_i-\frac{\partial L}{\partial x_{7n+j}\partial x_{8n+i}}dx_{7n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{7n+j}\partial x_{4n+i}}dx_{7n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{7n+j}\partial x_i}dx_{7n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{7n+j}\partial x_{2n+i}}dx_{7n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{7n+j}\partial x_{7n+i}}dx_{7n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{7n+j}\partial x_{9n+i}}dx_{7n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{7n+j}\partial x_{5n+i}}dx_{7n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{7n+j}\partial x_{n+i}}dx_{7n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{7n+j}\partial x_{6n+i}}dx_{7n+j}\wedge dx_{9n+i}$$
$$-\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{8n+j}\wedge dx_i-\frac{\partial L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{8n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{8n+j}\partial x_{4n+i}}dx_{8n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_i}dx_{8n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{8n+j}\partial x_{2n+i}}dx_{8n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{8n+j}\partial x_{7n+i}}dx_{8n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{8n+j}\partial x_{9n+i}}dx_{8n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_{5n+i}}dx_{8n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{8n+j}\partial x_{n+i}}dx_{8n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_{6n+i}}dx_{8n+j}\wedge dx_{9n+i}$$

$$-\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{8n+j}\wedge dx_i-\frac{\partial L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{8n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{8n+j}\partial x_{4n+i}}dx_{8n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_i}dx_{8n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{8n+j}\partial x_{2n+i}}dx_{8n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{8n+j}\partial x_{7n+i}}dx_{8n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{8n+j}\partial x_{9n+i}}dx_{8n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_{5n+i}}dx_{8n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{8n+j}\partial x_{n+i}}dx_{8n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{8n+j}\partial x_{6n+i}}dx_{8n+j}\wedge dx_{9n+i}$$
$$-\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{3n+i}}dx_{9n+j}\wedge dx_i-\frac{\partial L}{\partial x_{9n+j}\partial x_{8n+i}}dx_{9n+j}\wedge dx_{n+i}-\frac{\partial L}{\partial x_{9n+j}\partial x_{4n+i}}dx_{9n+j}\wedge dx_{2n+i}$$
$$+\frac{\partial L}{\partial x_{9n+j}\partial x_i}dx_{9n+j}\wedge dx_{3n+i}+\frac{\partial L}{\partial x_{9n+j}\partial x_{2n+i}}dx_{9n+j}\wedge dx_{4n+i}$$
$$-\frac{\partial L}{\partial x_{9n+j}\partial x_{7n+i}}dx_{9n+j}\wedge dx_{5n+i}-\frac{\partial L}{\partial x_{9n+j}\partial x_{9n+i}}dx_{9n+j}\wedge dx_{6n+i}$$
$$+\frac{\partial L}{\partial x_{9n+j}\partial x_{5n+i}}dx_{9n+j}\wedge dx_{7n+i}+\frac{\partial L}{\partial x_{9n+j}\partial x_{n+i}}dx_{9n+j}\wedge dx_{8n+i}$$
$$+\frac{\partial L}{\partial x_{9n+j}\partial x_{6n+i}}dx_{9n+j}\wedge dx_{9n+i}$$

Let

$$i_{G_3}\theta_L^{G_3}=-X^i\frac{\partial^2 L}{\partial x_j\partial x_{3n+i}}\delta_i^j dx_i+X^i\frac{\partial^2 L}{\partial x_j\partial x_{3n+i}}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_{8n+i}}dx_j-X^i\frac{\partial^2 L}{\partial x_j\partial x_{8n+i}}\delta_i^j dx_{n+i}$$
$$-X^{2n+i}\frac{\partial^2 L}{\partial x_j\partial x_{4n+i}}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_{4n+i}}\delta_i^j dx_{2n+i}-X^{3n+i}\frac{\partial^2 L}{\partial x_j\partial x_i}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_i}dx_{3n+i}$$
$$+X^{4n+i}\frac{\partial^2 L}{\partial x_j\partial x_{2n+i}}dx_j-X^i\frac{\partial^2 L}{\partial x_j\partial x_{2n+i}}\delta_i^j dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_j\partial x_{7n+i}}dx_j$$
$$+X^i\frac{\partial^2 L}{\partial x_j\partial x_{7n+i}}\delta_i^j dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_j\partial x_{9n+i}}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_{9n+i}}\delta_i^j dx_{6n+i}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_j\partial x_{5n+i}}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_{5n+i}}\delta_i^j dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_j\partial x_{n+i}}dx_j$$
$$+X^i\frac{\partial^2 L}{\partial x_j\partial x_{n+i}}\delta_i^j dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_j\partial x_{6n+i}}dx_j+X^i\frac{\partial^2 L}{\partial x_j\partial x_{6n+i}}\delta_i^j dx_{9n+i}$$
$$-X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{3n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{3n+i}}\delta_{n+i}^{n+j}dx_i-X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{8n+i}}dx_{n+j}$$
$$+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{8n+i}}\delta_{n+i}^{n+j}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{4n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{4n+i}}\delta_{n+i}^{n+j}dx_{2n+i}$$
$$+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_i}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_i}\delta_{n+i}^{n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{2n+i}}dx_{n+j}$$
$$+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{2n+i}}\delta_{n+i}^{n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{7n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{7n+i}}\delta_{n+i}^{n+j}dx_{5n+i}$$
$$-X^{6n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{9n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{9n+i}}\delta_{n+i}^{n+j}dx_{6n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{5n+i}}dx_{n+j}$$
$$+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{5n+i}}\delta_{n+i}^{n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{n+i}}\delta_{n+i}^{n+j}dx_{8n+i}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{6n+i}}dx_{n+j}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{6n+i}}\delta_{n+i}^{n+j}\ dx_{9n+i}$$

$$-X^{i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{3n+i}}dx_{2n+j}-X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{3n+i}}\delta^{2n+j}_{2n+i}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{8n+i}}dx_{2n+j}$$

$$-X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{8n+i}}\delta^{2n+j}_{2n+i}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{4n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{4n+i}}\delta^{2n+j}_{2n+i}dx_{2n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{i}}\delta^{2n+j}_{2n+i}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{2n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{2n+i}}\delta^{2n+j}_{2n+\delta^{2n+j}_{2n+i}j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{7n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{7n+i}}\delta^{2n+j}_{2n+i}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{9n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{9n+i}}\delta^{2n+j}_{2n+i}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{5n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{5n+i}}\delta^{2n+j}_{2n+i}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{n+i}}\delta^{2n+j}_{2n+i}dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{6n+i}}dx_{2n+j}$$

$$+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{6n+i}}\delta^{2n+j}_{2n+i}dx_{9n+i}$$

$$-X^{i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{3n+i}}dx_{3n+j}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{3n+i}}\delta^{3n+j}_{3n+i}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{8n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{8n+i}}\delta^{3n+j}_{3n+i}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{4n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{4n+i}}\delta^{3n+j}_{3n+i}dx_{2n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{i}}\delta^{3n+j}_{3n+i}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{2n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{2n+i}}\delta^{3n+j}_{3n+i}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{7n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{7n+i}}\delta^{3n+j}_{3n+i}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{9n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{9n+i}}\delta^{3n+j}_{3n+i}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{5n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{5n+i}}\delta^{3n+j}_{3n+i}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{n+i}}\delta^{3n+j}_{3n+i}dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{6n+i}}dx_{3n+j}$$

$$+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{6n+i}}\delta^{3n+j}_{3n+i}dx_{9n+i}$$

$$-X^{i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{3n+i}}dx_{4n+j}+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{3n+i}}\delta_{4n+i}^{4n+j}dx_{i}-X^{n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{8n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{8n+i}}\delta_{4n+i}^{4n+j}dx_{n+i}-X^{2n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{4n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{4n+i}}\delta_{4n+i}^{4n+j}dx_{2n+i}+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{i}}\delta_{4n+i}^{4n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{2n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{2n+i}}\delta_{4n+i}^{4n+j}dx_{4n+i}-X^{5n+i}\frac{\partial L}{\partial x_{4n+j}\partial x_{7n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial L}{\partial x_{4n+j}\partial x_{7n+i}}\delta_{4n+i}^{4n+j}dx_{5n+i}-X^{6n+i}\frac{\partial L}{\partial x_{4n+j}\partial x_{9n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{9n+i}}\delta_{4n+i}^{4n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{5n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{5n+i}}\delta_{4n+i}^{4n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{n+i}}\delta_{4n+i}^{4n+j}dx_{8n+i}+X^{9n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{6n+i}}dx_{4n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{6n+i}}\delta_{4n+i}^{4n+j}dx_{9n+i}$$
$$-X^{i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{3n+i}}dx_{5n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{3n+i}}\delta_{5n+i}^{5n+j}dx_{i}-X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{8n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{8n+i}}\delta_{5n+i}^{5n+j}dx_{n+i}-X^{2n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{4n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{4n+i}}\delta_{5n+i}^{5n+j}dx_{2n+i}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{i}}\delta_{5n+i}^{5n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{2n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{2n+i}}\delta_{5n+i}^{5n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{7n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{7n+i}}\delta_{5n+i}^{5n+j}dx_{5n+i}-X^{6n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{9n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{9n+i}}\delta_{5n+i}^{5n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{5n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{5n+i}}\delta_{5n+i}^{5n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{n+i}}\delta_{5n+i}^{5n+j}dx_{8n+i}+X^{9n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{6n+i}}dx_{5n+j}$$
$$+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{6n+i}}\delta_{5n+i}^{5n+j}dx_{9n+i}$$

$$-X^{i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{3n+i}}dx_{6n+j}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{3n+i}}\delta_{6n+i}^{6n+j}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{8n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{8n+i}}\delta_{6n+i}^{6n+j}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{4n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{4n+i}}\delta_{6n+i}^{6n+j}dx_{2n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{i}}\delta_{6n+i}^{6n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{2n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{2n+i}}\delta_{6n+i}^{6n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{7n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{7n+i}}\delta_{6n+i}^{6n+j}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{9n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{9n+i}}\delta_{6n+i}^{6n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{5n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{5n+i}}\delta_{6n+i}^{6n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{n+i}}\delta_{6n+i}^{6n+j}dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{6n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{6n+i}}\delta_{6n+i}^{6n+j}dx_{9n+i}$$

$$-X^{i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{3n+i}}dx_{7n+j}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{3n+i}}\delta_{7n+i}^{7n+j}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{8n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{8n+i}}\delta_{7n+i}^{7n+j}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{4n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{4n+i}}\delta_{7n+i}^{7n+j}dx_{2n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{i}}\delta_{7n+i}^{7n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{2n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{2n+i}}\delta_{7n+i}^{7n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{7n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{7n+i}}\delta_{7n+i}^{7n+j}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{9n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{9n+i}}\delta_{7n+i}^{7n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{5n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{5n+i}}X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{5n+i}}\delta_{7n+i}^{7n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{n+i}}\delta_{7n+i}^{7n+j}dx_{8n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{6n+i}}dx_{7n+j}$$
$$+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{6n+i}}\delta_{7n+i}^{7n+j}dx_{9n+i}$$

$$-X^{i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{8n+j}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}\delta_{8n+i}^{8n+j}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{8n+i}}\delta_{8n+i}^{8n+j}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{4n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{4n+i}}\delta_{8n+i}^{8n+j}dx_{2n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{i}}\delta_{8n+i}^{8n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}\delta_{8n+i}^{8n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{7n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{7n+i}}\delta_{8n+i}^{8n+j}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{9n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{9n+i}}\delta_{8n+i}^{8n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{5n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{5n+i}}\delta_{8n+i}^{8n+j}dx_{7n+i}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{n+i}}\delta_{8n+i}^{8n+j}dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{6n+i}}dx_{8n+j}$$
$$+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{6n+i}}\delta_{8n+i}^{8n+j}dx_{9n+i}$$
$$-X^{i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{8n+j}+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}\delta_{9n+i}^{9n+j}dx_{i}-X^{n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{8n+i}}\delta_{9n+i}^{9n+j}dx_{n+i}-X^{2n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{4n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{4n+i}}\delta_{9n+i}^{9n+j}dx_{2n+i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{i}}\delta_{9n+i}^{9n+j}dx_{3n+i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}\delta_{9n+i}^{9n+j}dx_{4n+i}-X^{5n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{7n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{7n+i}}\delta_{9n+i}^{9n+j}dx_{5n+i}-X^{6n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{9n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{9n+i}}\delta_{9n+i}^{9n+j}dx_{6n+i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{5n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{5n+i}}\delta_{9n+i}^{9n+j}dx_{7n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{n+i}}\delta_{9n+i}^{9n+j}dx_{8n+i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{6n+i}}dx_{8n+j}$$
$$+X^{9n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{6n+i}}\delta_{9n+i}^{9n+j}dx_{9n+i}$$

3.2 Definition (energy function)

$$E_L^{G_3}=U_{G_3}(L)-L$$

The closed standard 10-Kahler form $\theta_L^{G_3}$ on R^{10} is the symplectic structure. So it holds, given by

$$E_L^{G_3}=U_{G_3}(L)-L=$$
$$X^{i}\frac{\partial L}{\partial x_{3n+i}}+X^{n+i}\frac{\partial L}{\partial x_{8n+i}}+X^{2n+i}\frac{\partial L}{\partial x_{4n+i}}-X^{3n+i}\frac{\partial L}{\partial x_{i}}+X^{4n+i}\frac{\partial L}{\partial x_{2n+i}}+X^{5n+i}\frac{\partial L}{\partial x_{7n+i}}+X^{6n+i}\frac{\partial L}{\partial x_{9n+i}}$$
$$-X^{7n+i}\frac{\partial L}{\partial x_{5n+i}}-X^{8n+i}\frac{\partial L}{\partial x_{n+i}}-X^{9n+i}\frac{\partial L}{\partial x_{6n+i}}-L$$

the differential energy function it is obtained that

$$dE_L^{G_3} = d\left(X^i \frac{\partial L}{\partial x_{3n+i}} + X^{n+i} \frac{\partial L}{\partial x_{8n+i}} + X^{2n+i} \frac{\partial L}{\partial x_{4n+i}} - X^{3n+i} \frac{\partial L}{\partial x_i} - X^{4n+i} \frac{\partial L}{\partial x_{2n+i}} + X^{5n+i} \frac{\partial L}{\partial x_{7n+i}} + X^{6n+i} \frac{\partial L}{\partial x_{9n+i}} - X^{7n+i} \frac{\partial L}{\partial x_{5n+i}} - X^{8n+i} \frac{\partial L}{\partial x_{n+i}} - X^{9n+i} \frac{\partial L}{\partial x_{6n+i}} - L\right)$$

$$\begin{aligned}
dE_L^{G_3} = {} & X^i \frac{\partial^2 L}{\partial x_j \partial x_{3n+i}} dx_j + X^{n+i} \frac{\partial^2 L}{\partial x_j \partial x_{8n+i}} dx_j + X^{2n+i} \frac{\partial^2 L}{\partial x_j \partial x_{4n+i}} dx_j - X^{3n+i} \frac{\partial^2 L}{\partial x_j \partial x_i} dx_j \\
& - X^{4n+i} \frac{\partial^2 L}{\partial x_j \partial x_{2n+i}} dx_j + X^{5n+i} \frac{\partial^2 L}{\partial x_j \partial x_{7n+i}} dx_j + X^{6n+i} \frac{\partial^2 L}{\partial x_j \partial x_{9n+i}} dx_j \\
& - X^{7n+i} \frac{\partial^2 L}{\partial x_j \partial x_{5n+i}} dx_j - X^{8n+i} \frac{\partial^2 L}{\partial x_j \partial x_{n+i}} dx_j - X^{9n+i} \frac{\partial^2 L}{\partial x_j \partial x_{6n+i}} dx_j \\
& + X^i \frac{\partial^2 L}{\partial x_{n+j} \partial x_{3n+i}} dx_{n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{8n+i}} dx_{n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{4n+i}} dx_{n+j} - X^{3n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_i} dx_{n+j} \\
& - X^{4n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{2n+i}} dx_{n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{7n+i}} dx_{n+j} + X^{6n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{9n+i}} dx_{n+j} \\
& - X^{7n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{5n+i}} dx_{n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{n+i}} dx_{n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{6n+i}} dx_{n+j} \\
& + X^i \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{3n+i}} dx_{2n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{8n+i}} dx_{2n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{4n+i}} dx_{2n+j} \\
& - X^{3n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_i} dx_{2n+j} - X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{2n+i}} dx_{2n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{7n+i}} dx_{2n+j} \\
& + X^{6n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{9n+i}} dx_{2n+j} - X^{7n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{5n+i}} dx_{2n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{n+i}} dx_{2n+j} \\
& - X^{9n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{6n+i}} dx_{2n+j} \\
& + X^i \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{3n+i}} dx_{3n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{8n+i}} dx_{3n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{4n+i}} dx_{3n+j} \\
& - X^{3n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_i} dx_{3n+j} - X^{4n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{2n+i}} dx_{3n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{7n+i}} dx_{2n+j} \\
& + X^{6n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{9n+i}} dx_{3n+j} - X^{7n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{5n+i}} dx_{3n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{n+i}} dx_{3n+j} \\
& - X^{9n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{6n+i}} dx_{3n+j} \\
& + X^i \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{3n+i}} dx_{4n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{8n+i}} dx_{4n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{4n+i}} dx_{4n+j} \\
& - X^{3n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_i} dx_{4n+j} - X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{2n+i}} dx_{4n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{7n+i}} dx_{4n+j} \\
& + X^{6n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{9n+i}} dx_{4n+j} - X^{7n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{5n+i}} dx_{4n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{n+i}} dx_{4n+j} \\
& - X^{9n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{6n+i}} dx_{4n+j} \\
& + X^i \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{3n+i}} dx_{5n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{8n+i}} dx_{5n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{4n+i}} dx_{5n+j} \\
& - X^{3n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_i} dx_{5n+j} - X^{4n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{2n+i}} dx_{5n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{7n+i}} dx_{5n+j} \\
& + X^{6n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{9n+i}} dx_{5n+j} - X^{7n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{5n+i}} dx_{5n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{n+i}} dx_{5n+j} \\
& - X^{9n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{6n+i}} dx_{5n+j}
\end{aligned}$$

$$+X^{i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{3n+i}}dx_{6n+j}+X^{n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{8n+i}}dx_{6n+j}+X^{2n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{4n+i}}dx_{6n+j}$$
$$-X^{3n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{i}}dx_{6n+j}-X^{4n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{2n+i}}dx_{6n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{7n+i}}dx_{6n+j}$$
$$+X^{6n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{9n+i}}dx_{6n+j}-X^{7n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{5n+i}}dx_{6n+j}-X^{8n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{n+i}}dx_{6n+j}$$
$$-X^{9n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{6n+i}}dx_{6n+j}$$
$$+X^{i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{3n+i}}dx_{7n+j}+X^{n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{8n+i}}dx_{7n+j}+X^{2n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{4n+i}}dx_{7n+j}$$
$$-X^{3n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{i}}dx_{7n+j}-X^{4n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{2n+i}}dx_{7n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{7n+i}}dx_{7n+j}$$
$$+X^{6n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{9n+i}}dx_{7n+j}-X^{7n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{5n+i}}dx_{7n+j}-X^{8n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{n+i}}dx_{7n+j}$$
$$-X^{9n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{6n+i}}dx_{7n+j}$$
$$+X^{i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{8n+j}+X^{n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{8n+j}+X^{2n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{4n+i}}dx_{8n+j}$$
$$-X^{3n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{i}}dx_{8n+j}-X^{4n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{2n+i}}dx_{8n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{7n+i}}dx_{8n+j}$$
$$+X^{6n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{9n+i}}dx_{8n+j}-X^{7n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{5n+i}}dx_{8n+j}-X^{8n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{n+i}}dx_{8n+j}$$
$$-X^{9n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{6n+i}}dx_{8n+j}$$
$$+X^{i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{3n+i}}dx_{9n+j}+X^{n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{8n+i}}dx_{9n+j}+X^{2n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{4n+i}}dx_{9n+j}$$
$$-X^{3n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{i}}dx_{9n+j}-X^{4n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{2n+i}}dx_{9n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{7n+i}}dx_{9n+j}$$
$$+X^{6n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{9n+i}}dx_{9n+j}-X^{7n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{5n+i}}dx_{9n+j}-X^{8n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{n+i}}dx_{9n+j}$$
$$-X^{9n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{6n+i}}dx_{9n+j}$$
$$-\frac{\partial L}{\partial x_{j}}dx_{j}-\frac{\partial L}{\partial x_{n+j}}dx_{n+j}-\frac{\partial L}{\partial x_{2n+j}}dx_{2n+j}-\frac{\partial L}{\partial x_{3n+j}}dx_{3n+j}-\frac{\partial L}{\partial x_{4n+j}}dx_{4n+j}-\frac{\partial L}{\partial x_{5n+j}}dx_{5n+j}$$
$$-\frac{\partial L}{\partial x_{6n+j}}dx_{6n+j}-\frac{\partial L}{\partial x_{7n+j}}dx_{7n+j}-\frac{\partial L}{\partial x_{8n+j}}dx_{8n+j}-\frac{\partial L}{\partial x_{9n+j}}dx_{9n+j}$$

Be an integral curve .in local coordinates it is obtained that

$$-X^{i}\frac{\partial^{2}L}{\partial x_{j}\partial x_{3n+i}}dx_{j}-X^{n+i}\frac{\partial^{2}L}{\partial x_{n+j}\partial x_{3n+i}}dx_{j}-X^{2n+i}\frac{\partial^{2}L}{\partial x_{2n+j}\partial x_{3n+i}}dx_{j}-X^{3n+i}\frac{\partial^{2}L}{\partial x_{3n+j}\partial x_{3n+i}}dx_{j}$$
$$-X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{3n+i}}dx_{j}-X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{3n+i}}dx_{j}-X^{6n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{3n+i}}dx_{j}$$
$$-X^{7n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{3n+i}}dx_{j}-X^{8n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{3n+i}}dx_{j}-X^{9n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{3n+i}}dx_{j}$$
$$+X^{i}\frac{\partial^{2}L}{\partial x_{j}\partial x_{8n+i}}dx_{n+j}+X^{n+i}\frac{\partial^{2}L}{\partial x_{n+j}\partial x_{8n+i}}dx_{n+j}+X^{2n+i}\frac{\partial^{2}L}{\partial x_{2n+j}\partial x_{8n+i}}dx_{n+j}+\frac{\partial^{2}L}{\partial x_{3n+j}\partial x_{8n+i}}dx_{n+j}$$
$$+X^{4n+i}\frac{\partial^{2}L}{\partial x_{4n+j}\partial x_{8n+i}}dx_{n+j}+X^{5n+i}\frac{\partial^{2}L}{\partial x_{5n+j}\partial x_{8n+i}}dx_{n+j}+X^{6n+i}\frac{\partial^{2}L}{\partial x_{6n+j}\partial x_{8n+i}}dx_{n+j}$$
$$+X^{7n+i}\frac{\partial^{2}L}{\partial x_{7n+j}\partial x_{8n+i}}dx_{n+j}+X^{8n+i}\frac{\partial^{2}L}{\partial x_{8n+j}\partial x_{8n+i}}dx_{n+j}+X^{9n+i}\frac{\partial^{2}L}{\partial x_{9n+j}\partial x_{8n+i}}dx_{n+j}$$

$$+X^i \frac{\partial^2 L}{\partial x_j \partial x_{4n+i}} dx_{2n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{4n+i}} dx_{2n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{4n+i}} dx_{2n+j} + \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{4n+i}} dx_{2n+j}$$
$$+ X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{4n+i}} dx_{2n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{4n+i}} dx_{2n+j} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{4n+i}} dx_{2n+j}$$
$$+ X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{4n+i}} dx_{2n+j} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{4n+i}} dx_{2n+j} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{4n+i}} dx_{2n+j}$$
$$-X^i \frac{\partial^2 L}{\partial x_j \partial x_i} dx_{3n+j} - X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_i} dx_{3n+j} - X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_i} dx_{3n+j} - \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{4n+i}} dx_{3n+j}$$
$$- X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_i} dx_{3n+j} - X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_i} dx_{3n+j} - X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_i} dx_{3n+j}$$
$$- X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_i} dx_{3n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{4n+i}} dx_{3n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_i} dx_{3n+j}$$
$$-X^i \frac{\partial^2 L}{\partial x_j \partial x_{2n+i}} dx_{4n+j} - X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{2n+i}} dx_{4n+j} - X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{2n+i}} dx_{4n+j} - \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{2n+i}} dx_{4n+j}$$
$$- X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{2n+i}} dx_{4n+j} - X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{2n+i}} dx_{4n+j} - X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{2n+i}} dx_{4n+j}$$
$$- X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{2n+i}} dx_{4n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{2n+i}} dx_{4n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{2n+i}} dx_{4n+j}$$
$$+X^i \frac{\partial^2 L}{\partial x_j \partial x_{7n+i}} dx_{5n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{7n+i}} dx_{5n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{7n+i}} dx_{5n+j} + \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{7n+i}} dx_{5n+j}$$
$$+ X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+i} \partial x_{7n+i}} dx_{5n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{7n+i}} dx_{5n+j} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{7n+i}} dx_{5n+j}$$
$$+ X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{7n+i}} dx_{5n+j} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{7n+i}} dx_{5n+j} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{7n+i}} dx_{5n+j}$$
$$+X^i \frac{\partial^2 L}{\partial x_j \partial x_{9n+i}} dx_{6n+j} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{9n+i}} dx_{6n+j} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{9n+i}} dx_{6n+j} + \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{9n+i}} dx_{6n+j}$$
$$+ X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+i} \partial x_{9n+i}} dx_{6n+j} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{9n+i}} dx_{6n+j} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{9n+i}} dx_{6n+j}$$
$$+ X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{9n+i}} dx_{6n+j} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{9n+i}} dx_{6n+j} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{9n+i}} dx_{6n+j}$$
$$-X^i \frac{\partial^2 L}{\partial x_j \partial x_{5n+i}} dx_{7n+j} - X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{5n+i}} dx_{7n+j} - X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{5n+i}} dx_{7n+j} - \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{5n+i}} dx_{7n+j}$$
$$- X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+i} \partial x_{5n+i}} dx_{7n+j} - X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{5n+i}} dx_{7n+j} - X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{5n+i}} dx_{7n+j}$$
$$- X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{5n+i}} dx_{7n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{5n+i}} dx_{7n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{5n+i}} dx_{7n+j}$$
$$-X^i \frac{\partial^2 L}{\partial x_j \partial x_{n+i}} dx_{8n+j} - X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{n+i}} dx_{8n+j} - X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{n+i}} dx_{8n+j} - \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{n+i}} dx_{8n+j}$$
$$- X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+i} \partial x_{n+i}} dx_{8n+j} - X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{n+i}} dx_{8n+j} - X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{n+i}} dx_{8n+j}$$
$$- X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{n+i}} dx_{8n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{n+i}} dx_{8n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{n+i}} dx_{8n+j}$$
$$-X^i \frac{\partial^2 L}{\partial x_j \partial x_{6n+i}} dx_{9n+j} - X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{6n+i}} dx_{9n+j} - X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{6n+i}} dx_{9n+j} - \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{6n+i}} dx_{9n+j}$$
$$- X^{4n+i} \frac{\partial^2 L}{\partial x_{2n+i} \partial x_{6n+i}} dx_{9n+j} - X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{6n+i}} dx_{9n+j} - X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{6n+i}} dx_{9n+j}$$
$$- X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{6n+i}} dx_{9n+j} - X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{6n+i}} dx_{9n+j} - X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{6n+i}} dx_{9n+j}$$

$$+\frac{\partial L}{\partial x_j}dx_j+\frac{\partial L}{\partial x_{n+j}}dx_{n+j}+\frac{\partial L}{\partial x_{2n+j}}dx_{2n+j}+\frac{\partial L}{\partial x_{3n+j}}dx_{3n+j}+\frac{\partial L}{\partial x_{4n+j}}dx_{4n+j}+\frac{\partial L}{\partial x_{5n+j}}dx_{5n+j}+\frac{\partial L}{\partial x_{6n+j}}dx_{6n+j}+\frac{\partial L}{\partial x_{7n+j}}dx_{7n+j}+\frac{\partial L}{\partial x_{8n+j}}dx_{8n+j}+\frac{\partial L}{\partial x_{9n+j}}dx_{9n+j}=0$$

And

$$[X^i\frac{\partial^2 L}{\partial x_j\partial x_i}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_i}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_i}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_i}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_i}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{3n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_i}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_i}dx_j+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_i}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_i}]dx_j+\frac{\partial L}{\partial x_{3n+i}}dx_j=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_i}\right)+\frac{\partial L}{\partial x_{3n+i}}=0$$

$$[X^i\frac{\partial^2 L}{\partial x_j\partial x_{n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{n+i}}]dx_{n+j}+\frac{\partial L}{\partial x_{8n+i}}dx_{n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{n+i}}\right)+\frac{\partial L}{\partial x_{8n+i}}=0$$

$$+[X^i\frac{\partial^2 L}{\partial x_j\partial x_{2n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{2n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{2n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{2n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{2n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{2n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{2n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{2n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{2n+i}}]dx_{2n+j}+\frac{\partial L}{\partial x_{4n+i}}dx_{2n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{2n+i}}\right)+\frac{\partial L}{\partial x_{4n+i}}=0$$

$$-[X^i\frac{\partial^2 L}{\partial x_j\partial x_{3n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{3n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{3n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{3n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{3n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{3n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{3n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{3n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{3n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{3n+i}}]dx_{3n+j}+\frac{\partial L}{\partial x_i}dx_{3n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{3n+i}}\right)-\frac{\partial L}{\partial x_{3n+i}}=0$$

$$-[X^i\frac{\partial^2 L}{\partial x_j\partial x_{2n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{2n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{2n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{2n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{2n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{2n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{2n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{2n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{2n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{2n+i}}]dx_{4n+j}+\frac{\partial L}{\partial x_{2n+i}}dx_{4n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{4n+i}}\right)-\frac{\partial L}{\partial x_{2n+i}}=0$$

$$[X^i\frac{\partial^2 L}{\partial x_j\partial x_{5n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{5n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{5n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{5n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{5n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{5n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{5n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{5n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{5n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{5n+i}}]dx_{5n+j}+\frac{\partial L}{\partial x_{7n+i}}dx_{5n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{5n+i}}\right)+\frac{\partial L}{\partial x_{7n+i}}=0$$

$$[X^i\frac{\partial^2 L}{\partial x_j\partial x_{6n+i}}+X^{n+i}\frac{\partial^2 L}{\partial x_{n+j}\partial x_{6n+i}}+X^{2n+i}\frac{\partial^2 L}{\partial x_{2n+j}\partial x_{6n+i}}+X^{3n+i}\frac{\partial^2 L}{\partial x_{3n+j}\partial x_{6n+i}}+X^{4n+i}\frac{\partial^2 L}{\partial x_{4n+j}\partial x_{6n+i}}+X^{5n+i}\frac{\partial^2 L}{\partial x_{5n+j}\partial x_{6n+i}}+X^{6n+i}\frac{\partial^2 L}{\partial x_{6n+j}\partial x_{6n+i}}+X^{7n+i}\frac{\partial^2 L}{\partial x_{7n+j}\partial x_{6n+i}}+X^{8n+i}\frac{\partial^2 L}{\partial x_{8n+j}\partial x_{6n+i}}+X^{9n+i}\frac{\partial^2 L}{\partial x_{9n+j}\partial x_{6n+i}}]dx_{6n+j}+\frac{\partial L}{\partial x_{9n+i}}dx_{6n+j}=0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{6n+i}}\right)+\frac{\partial L}{\partial x_{9n+i}}=0$$

$-[X^i \frac{\partial^2 L}{\partial x_j \partial x_{7n+i}} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{7n+i}} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{7n+i}} + X^{3n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{7n+i}} + X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{7n+i}} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{7n+i}} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{7n+i}} + X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{7n+i}} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{7n+i}} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{7n+i}}] dx_{7n+j} + \frac{\partial L}{\partial x_{5n+i}} dx_{7n+j} = 0$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{7n+i}}\right) - \frac{\partial L}{\partial x_{5n+i}} = 0$$

$-[X^i \frac{\partial^2 L}{\partial x_j \partial x_{8n+i}} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{8n+i}} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{8n+i}} + X^{3n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{8n+i}} + X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{8n+i}} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{8n+i}} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{8n+i}} + X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{8n+i}} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{8n+i}} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{8n+i}}] dx_{8n+j} + \frac{\partial L}{\partial x_i} dx_{8n+j} = 0$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{8n+i}}\right) - \frac{\partial L}{\partial x_i} = 0$$

$-[X^i \frac{\partial^2 L}{\partial x_j \partial x_{9n+i}} + X^{n+i} \frac{\partial^2 L}{\partial x_{n+j} \partial x_{9n+i}} + X^{2n+i} \frac{\partial^2 L}{\partial x_{2n+j} \partial x_{9n+i}} + X^{3n+i} \frac{\partial^2 L}{\partial x_{3n+j} \partial x_{9n+i}} + X^{4n+i} \frac{\partial^2 L}{\partial x_{4n+j} \partial x_{9n+i}} + X^{5n+i} \frac{\partial^2 L}{\partial x_{5n+j} \partial x_{9n+i}} + X^{6n+i} \frac{\partial^2 L}{\partial x_{6n+j} \partial x_{9n+i}} + X^{7n+i} \frac{\partial^2 L}{\partial x_{7n+j} \partial x_{9n+i}} + X^{8n+i} \frac{\partial^2 L}{\partial x_{8n+j} \partial x_{9n+i}} + X^{9n+i} \frac{\partial^2 L}{\partial x_{9n+j} \partial x_{9n+i}}] dx_{9n+j} + \frac{\partial L}{\partial x_{6n+i}} dx_{9n+j} = 0$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{9n+i}}\right) - \frac{\partial L}{\partial x_{6n+i}} = 0$$

Thus

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_i}\right) + \frac{\partial L}{\partial x_{3n+i}} = 0 \quad , \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{n+i}}\right) + \frac{\partial L}{\partial x_{8n+i}} = 0 \;, \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{2n+i}}\right) + \frac{\partial L}{\partial x_{4n+i}} = 0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{3n+i}}\right) - \frac{\partial L}{\partial x_i} = 0 \;, \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{4n+i}}\right) - \frac{\partial L}{\partial x_{2n+i}} = 0 \;, \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{5n+i}}\right) + \frac{\partial L}{\partial x_{7n+i}} = 0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{6n+i}}\right) + \frac{\partial L}{\partial x_{9n+i}} = 0 \;, \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{7n+i}}\right) - \frac{\partial L}{\partial x_{5n+i}} = 0 \;, \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{8n+i}}\right) - \frac{\partial L}{\partial x_{n+i}} = 0$$
$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{9n+i}}\right) - \frac{\partial L}{\partial x_{6n+i}} = 0$$

Thus the equations obtained in Eq. ( ) are seen to be Lagrangian equations with respect to almost 10 Kahler structure U on 10- Kahler manifold (R^{10n}, U), .by means of $\theta_L^{G_3}$ and then the triple $(R^{10n}, \theta_L^{G_3}, \lambda)$ is seen to be a Lagrangian mechanical system on 10n-Kahler manifold (R^{10n}, U).

Fourth,

let (R^{10n}, U). be a 10- Kahler manifold. Suppose that an element of almost 10- Kahler structure U, a Liouville form and a 1-form on 10- Kahler manifold (R^{10n}, U) are denoted by G_4 , respectively.

Let vector field λ determined by

$$U = G_4(\lambda) = X^i \frac{\partial}{\partial x_{4n+i}} + X^{n+i} \frac{\partial}{\partial x_{6n+i}} + X^{2n+i} \frac{\partial}{\partial x_{7n+i}} + X^{3n+i} \frac{\partial}{\partial x_{8n+i}} + X^{4n+i} \frac{\partial}{\partial x_i} + X^{5n+i} \frac{\partial}{\partial x_{9n+i}} - X^{6n+i} \frac{\partial}{\partial x_{n+i}} - X^{7n+i} \frac{\partial}{\partial x_{2n+i}} - X^{8n+i} \frac{\partial}{\partial x_{3n+i}} - X^{9n+i} \frac{\partial}{\partial x_{5n+i}}$$

is called Liouville vector field on the standard 10-Kahler manifold

The Lagrangian function (energy function)

$$L = T - P$$

$E_L^{G_4} = U_{G_4}(L) - L$

Is vertical derivation (differentiation) d_{G_2} is defined

$$d_{G_4} = [i_{G_4}, d] = i_{G_4} d - d i_{G_4}$$

$\theta_L^{G_4} = d d_{G_4} L$ such that

Defined by operator $\quad d_{G_4}: A(R^{10n}) \to \wedge^1 R^{10n}$

The closed standard 10-Kahler form $\theta_L^{G_4}$ on R^{10} is the symplectic structure. So it holds

$E_L^{G_4} = U_{G_4}(L) - L =$

$$X^i \frac{\partial L}{\partial x_{4n+i}} + X^{n+i} \frac{\partial L}{\partial x_{6n+i}} + X^{2n+i} \frac{\partial L}{\partial x_{7n+i}} + X^{3n+i} \frac{\partial L}{\partial x_{8n+i}} + X^{4n+i} \frac{\partial L}{\partial x_i} + X^{5n+i} \frac{\partial L}{\partial x_{9n+i}} - X^{6n+i} \frac{\partial L}{\partial x_{n+i}} - X^{7n+i} \frac{\partial L}{\partial x_{2n+i}} - X^{8n+i} \frac{\partial L}{\partial x_{3n+i}} - X^{9n+i} \frac{\partial L}{\partial x_{5n+i}} - L$$

By means of Eq. (1), using (6), (15) and (17), also taking into consideration the above first part we calculate the equations

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_i}\right) + \frac{\partial L}{\partial x_{4n+i}} = 0 \quad , \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{n+i}}\right) + \frac{\partial L}{\partial x_{6n+i}} = 0 \; , \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{2n+i}}\right) + \frac{\partial L}{\partial x_{7n+i}} = 0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{3n+i}}\right) + \frac{\partial L}{\partial x_{8n+i}} = 0 \quad , \quad \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{4n+i}}\right) - \frac{\partial L}{\partial x_i} = 0 \; , \; \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{5n+i}}\right) + \frac{\partial L}{\partial x_{9n+i}} = 0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{6n+i}}\right) - \frac{\partial L}{\partial x_{n+i}} = 0 \; , \; \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{7n+i}}\right) - \frac{\partial L}{\partial x_{2n+i}} = 0 \; , \; \frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{8n+i}}\right) - \frac{\partial L}{\partial x_{3n+i}} = 0$$

$$\frac{\partial}{\partial t}\left(\frac{\partial L}{\partial x_{9n+i}}\right) - \frac{\partial L}{\partial x_{5n+i}} = 0$$

Thus the equations obtained in Eq. (17) are seen to be Lagrangian equations with respect to almost 10 Kahler structure U on 10- Kahler manifold (R^{10n}, U), .by means of $\theta_L^{G_4}$ and then the triple $(R^{10n}, \theta_L^{G_4}, \lambda)$ is seen to be a Lagrangian mechanical system on 10n-Kahler manifold (R^{10n}, U).

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