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Curvature Tensors in A Kaehler Manifold with Semi-Symmetric Metric Connection

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ABSTRACT

In the present communication studies have been carried out with special reference to Semi-Symmetric curvature tensor, Weyl's projective curvature tensor, Concircular curvature tensor, Conharmonic curvature tensor and H-Projective curvature tensor.

Keywords : Kaehler manifold, Semi-Symmetric curvature tensor, Weyl's projective curvature tensor, Concircular curvature tensor, Conharmonic curvature tensor and H-Projective curvature tensor.

INTRODUCTION:

. We consider the 2n dimensional Kaehler manifold M_n with structure $\{F, g\}$, here F stands for a real valued function and g stands for the metric tensor, the two satisfy the following:

(1.1) (a) $\bar{\bar{X}} + X = 0$, (b) $g(\bar{X}, \bar{Y}) = g(X, Y)$.

(1.2) $g(X, Y) = g(Y, X)$

(1.3) $(\nabla_X F)(Y) = 0$

where (1.4) $\bar{X} \overset{\text{def}}{=} FX$.

Here, X and Y are arbitrary vector fields and ∇ is the Riemaninian connection on the manifold M_{2n} .

In the Kaehler manifold under consideration let us consider that K is the curvature tensor with respect to the connection ∇ defined by [3]

(1.5) $K(X, Y, Z) \overset{\text{def}}{=} \nabla_X \nabla_Y Z - \nabla_Y \nabla_X Z - \nabla_{[X,Y]} Z$.

As per this definition the following properties may easily be derived [3]

(1.6) (a) $K(X, Y, \bar{Z}) = \overline{K(X, Y, Z)}$,

(b) $K(X, Y, Z) + \overline{K(X, Y, Z)} = 0$,

(c) $K(X, Y, \bar{Z}, W) + K(X, Y, Z, \bar{W}) = 0$,

(d) $K(X, Y, \bar{Z}, \bar{W}) + K(\bar{X}, \bar{Y}, Z, W) = 0$,

(e) $K(\bar{X}, \bar{Y}, \bar{Z}, \bar{W}) = K(X, Y, Z, W) = K(X, Y, \bar{Z}, \bar{W})$,

(f) $K(X, \bar{Y}, Z, W) = K(X, Y, Z, \bar{W})$,

(g) $K(X, \bar{Y}, \bar{Z}, W) = K(\bar{X}, Y, Z, \bar{W})$,

where (1.7) $K(X, Y, Z, W) = g(K(X, Y, Z), W)$.

The Ricci tensor of $2n$ dimensional Kaehler manifold M_{2n} denoted by Ric. possesses the following properties

(1.8) (a) $Ric.(\bar{X}, \bar{Y}) = Ric.(X, Y)$,

(b) $Ric.(X, \bar{Y}) + Ric.(\bar{X}, Y) = 0,$

(c) $R\bar{X} = \overline{RX},$

and (d) $-\overline{R\bar{X}} = RX.$

Here, X, Y, Z and W appearing in (1.7) and (1.8) are arbitrary vector fields.

The Weyl's projective curvature tensor W is given by

(1.9) $W(X, Y, Z) = K(X, Y, Z) + \frac{1}{n-1}\{Ric.(X, Z)Y - Ric.(Y, Z)X\}.$

This tensor satisfies the following properties [4]

(1.10) (a) $W(\bar{X}, \bar{Y}, \bar{Z}, \bar{u}) = W(X, Y, Z, u),$

(b) $W(\bar{X}, \bar{Y}, Z, u) = W(X, Y, \bar{Z}, \bar{u}),$

(c) $W(X, Y, Z, u) \stackrel{\text{def}}{=} g(W(X, Y, Z), u),$

and X, Y, Z and u are arbitrary vector fields.

The concircular curvature tensor C is defined as

(1.11) $C(X, Y, Z) = K(X, Y, Z) - \frac{r}{n(n-1)}\{g(Y, Z)X - g(X, Z)Y\}$

where, r is the scalar curvature tensor in M_n.

The concircular curvature tensor as has been defined in (1.11) satisfies the following:

(1.12) (a) $C(\bar{X}, \bar{Y}, \bar{Z}, \bar{u}) = {}'C(X, Y, Z, u),$

(b) $C(\bar{X}, \bar{Y}, Z, u) = {}'C(X, Y, \bar{Z}, \bar{u}),$

(c) $C(X, Y, Z, u) \stackrel{\text{def}}{=} g(C(X, Y, Z), u),$

and X, Y, Z, u are arbitrary vector fields.

The Conharmonic curvature tensor L is defined as

(1.13) $L(X, Y, Z) = K(X, Y, Z) - \frac{1}{n-2}\{Ric(Y, Z)X - Ric(X, Z)Y\} + \{g(Y, Z)RX - g(X, Z)RY\}$

and this curvature tensure satisfies the following properties

(1.14) (a) $L(\bar{X}, \bar{Y}, Z, \bar{u}) = L(X, Y, Z, u)$

(b) $L(\bar{X}, \bar{Y}, Z, u) = L(X, Y, \bar{Z}, \bar{u})$

where (c) $L(X, Y, Z, u) = g(L(X, Y, Z), u).$

The H-projective curvature tensor has the following properties

(1.16) (a) $P(X, Y, Z, u) = P(Y, X, Z, u),$

(b) $P(X, Y, Z, u) + P(Y, Z, X, u) + P(Z, X, Y, u) = 0$

where (c) $P(X, Y, Z, u) = g(P(X, Y, Z), u).$

In this continuation, we shall also have the following [5]

(1.17) $\tilde{K}(X, Y)Z = K(X, Y)Z - \alpha(Y, Z)X - \alpha(X, Z)Y - g(Y, Z)AX + g(X, Z)AY$

where (1.18) $\alpha(Y, Z) = g(A, Y, Z) = (\nabla_Y \omega)(Z) - \omega(Y)\omega(Z) + \frac{1}{2}\omega(\rho)g(Y, Z)$

and A is a 1-form.

2. SEMI –SMMETRIC CURVATURE TENSOR $\tilde{K}$ AND ITS PROPERTIES IN CASE $\tilde{\nabla}_X \omega = 0$

A semi symmetric metric connection is a linear connection $\tilde{\nabla}$ on M_{2n} provided the torsion tensor T of the connection $\tilde{\nabla}$ and the matric tensor g of the manifold satisfies the following conditions:

(2.1) (a) $(\tilde{\nabla}_Z g)(X, Y) = 0,$

(b) $T(X, Y) = \omega(Y)X - \omega(X)Y$

where ω is a 1-form and X, Y are arbitrary vector fields.

The 1-form ω vector fields are usually termed as 1-form vector fields associated with the metric tensor g by the relation

(2.2) (a) $\omega(X)X = g(X, \rho)$

and (b) $(\tilde{\nabla}_Z \omega)(Y) = (\nabla_X \omega)(Y) - \omega(X)\omega(Y) + \omega(\rho)g(X, Y)$

Let us write

(2.3) $(\tilde{\nabla}_Y \omega)(Z) = 0.$

Using (2.2) in (2.3), we get

(2.4) $(\nabla_Y \omega)(Z) = \omega(Y)\omega(Z) - \omega(\rho)g(Y,Z)$.

Using (1.1b), we have

(2.5) $\omega(Z) = g(Z,\rho)$.

Differentiating (2.5) covariantly with espect to y, we get

(2.6) $(\nabla_Y \omega)(Z) + \omega(\nabla_Y Z) = g(\nabla_Y Z,\rho) + g(Z,\nabla_Y \rho)$.

Using (2.5) in (2.6), we get

(2.7) $(\nabla_Y \omega)(Z) = g(Z,\nabla_Y \rho)$.

with the help of (2.4) and (2.7), we get

(2.8) $\alpha(Y,Z) = -\frac{1}{2}\omega(\rho)g(Y,Z)$

and

(2.9) $AY = -\frac{1}{2}\omega(\rho)Y$.

Using (2.8) and (2.9) in (1.17), we get

(2.10) $\tilde{K}(X,Y,Z) = K(X,Y,Z) + \omega(\rho)\{g(Y,Z)X - g(X,Z)Y\}$

where, $\tilde{K}$ is the curvature tensor with respect to the semi-symmetric connection $\tilde{\nabla}$.

In the light of all these observations, we can therefore state:

Theorem (2.1):

The semi-symmetric curvature tensor $\tilde{K}$ with respect to the semi-symmetric metric connection $\tilde{\nabla}$ always satisfies (2.10).

We now define

(2.11) $\tilde{K}(X,Y,Z,u) \overset{\text{def}}{=} g(\tilde{K}(X,Y,Z),u)$.

Using (2.10) in (2.11), we get

(2.12) $\tilde{K}(X,Y,Z,u) = K(X,Y,Z,u) + \omega(\rho)\{g(Y,Z)g(X,u) - g(X,Z)g(Y,u)\}$.

Barring X,Y,Z,u in (2.12) and thereafter using (1.2) and (1.6d), we get

(2.13) $\tilde{K}(\bar{X},\bar{Y},\bar{Z},\bar{u}) = \tilde{K}(X,Y,Z,u)$.

We further put bars on X and Y and (2.13) and get

(2.14) $\tilde{K}(X,Y,\bar{Z},\bar{u}) = \tilde{K}(\bar{X},\bar{Y},Z,u)$.

From (2.6), we get the following

(2.15) $\tilde{K}(\bar{X},Y,Z,u) = \tilde{K}(\bar{X},Y,Z,u) + \omega(\rho)\{g(Y,Z)g(\bar{X},u) - g(\bar{X},Z)g(Y,u)\}$,

(2.16) $\tilde{K}(X,\bar{Y},Z,u) = \tilde{K}(X,\bar{Y},Z,u) + \omega(\rho)\{g(\bar{Y},Z)g(X,u) - g(X,Z)g(\bar{Y},u)\}$,

(2.17) $\tilde{K}(X,Y,\bar{Z},u) = \tilde{K}(\bar{X},Y,\bar{Z},u) + \omega(\rho)\{g(Y,\bar{Z})g(X,u) - g(X,\bar{Z})g(Y,u)\}$,

and (2.18) $\tilde{K}(X,Y,Z,\bar{u}) = \tilde{K}(\bar{X},Y,Z,\bar{u}) + \omega(\rho)\{g(Y,Z)g(X,\bar{u}) - g(X,Z)g(Y,\bar{u})\}$,

Adding (2.15), (2.16), (2.17) and (2.18) and thereafter using (1.6c), we get

(2.19) $\tilde{K}(\bar{X},Y,Z,u) = \tilde{K}(X,\bar{Y},Z,u) + \tilde{K}(X,Y,\bar{Z},u) + \tilde{K}(X,Y,Z,\bar{u}) + \tilde{K}(\bar{X},Y,Z,u)$

where, we have taken into account

(2.20) (a) $F(X,Y) + F(Y,X) = g(\bar{X},Y) + g(X,\bar{Y}) = 0$

(b) $F(X,Y) = g(\bar{X},Y)$.

In the light of all these observations, we can therefore state:

Theorem (2.2):

In a Kaehler manifold the cuvature tensor $\tilde{K}$ associated with semi-symmetric metric connection $\tilde{\nabla}$ satisfies (2.13), (2.14) and (2.19) provided $(\tilde{\nabla}_Y \omega)(Z) = 0$.

3. PROPERTIES OF WEYL'S PROJECTIVE CURVATURE TENSOR $\tilde{W}$, CONCIRCULAR CURVATURE TENSOR $\tilde{L}$ WITH RESPECT TO SEMI-SYMMETRIC METRIC CONNECTION $\tilde{\nabla}$

The Weyl's projective curvature tensor $\tilde{W}$ is defined as

(3.1) $\tilde{W}(X,Y,Z) = K(X,Y,Z) + \frac{1}{n-1}\{\widetilde{Ric}.(X,Z)Y - \widetilde{Ric}.(Y,Z)X\}$

where $\widetilde{Ric}.$ is the Ricci tensor with respect to semi-symetric connection $\widetilde{\nabla}$.
Contracting (2.10), we get

(3.2) $\widetilde{Ric}.(Y,Z) = Ric.(Y,Z) + (n-1)\omega(\rho)g(Y,Z)$.

Using (2.10) and (3.2) in (3.1), we get

(3.3) $\widetilde{W}(X,Y,Z) = K(X,Y,Z) + \omega(\rho)\{g(Y,Z)X - g(X,Z)Y\} + \frac{1}{n-1}\{Ric.(X,Z)Y + (n-1)\omega(\rho)g(X,Z)Y - Ric.(Y,Z)X + (n-1)\omega(\rho)g(Y,Z)X\}$.

with the help of (3.3), we can easily derive

(3.4) $\widetilde{W}(X,Y,Z) = K(X,Y,Z) + \frac{1}{n-1}\{Ric.(X,Z)Y - Ric.(Y,Z)X\}$.

We now assume the following

(3.5) $\widetilde{W}(X,Y,Z,u) = g(\overline{W}(X,Y,Z),u)$.

Using (3.5) in (3.4), we get

(3.6) $\widetilde{W}(X,Y,Z,u) = K(X,Y,Z,u) + \frac{1}{n-1}\{Ric.(X,Z)g(Y,u) - Ric.(Y,Z)g(X,u)\}$

Using (1.9) and (1.10c), we get

(3.7) $\widetilde{W}(X,Y,Z,u) = W(X,Y,Z,u)$.

On barring X, Y, Z, u in (3.7) and thereafter (1.10a), we get

(3.8) $\widetilde{W}(\bar{X},\bar{Y},\bar{Z},\bar{u}) = \widetilde{W}(X,Y,Z,u)$.

Again we put bars on X, Y in (3.7) and then use (1.10b) and get

(3.9) $\widetilde{W}(\bar{X},\bar{Y},Z,u) = \widetilde{W}(X,Y,\bar{Z},\bar{u})$.

We again put bars on Y and Z in (3.7) and get

(3.10) $\widetilde{W}(X,\bar{Y},\bar{Z},u) = \widetilde{W}(\bar{X},Y,Z,\bar{u})$.

All these observations enable us to state:

Theorem (3.1):

The Weyl's projective curvature tensor $\widetilde{W}(X,Y,Z)$ with respect to the semi-symmetric metric connection $\widetilde{\nabla}$ respectively satisfies (3.8), (3.9) and (3.10).

We now consider the concircular curvature tensor $\tilde{C}(X,Y,Z)$ defined by

(3.11) $\tilde{C}(X,Y,Z) = \widetilde{K}(X,Y,Z) + \frac{r}{n-1}\{g(Y,Z)X - g(X,Z)y\}$.

Making use of (2.10) in (3.11), we get

(3.12) $\tilde{C}(X,Y,Z) = \widetilde{K}(X,Y,Z) + \omega(\rho)\{g(Y,Z)X - g(X,Z)Y\} - \frac{r}{n(n-1)}\{g(Y,Z)X - g(X,Z)Y\}$.

Using (1.11) in (3.12), we get

(3.13) $\tilde{C}(X,Y,Z) = C(X,Y,Z) + \omega(\rho)\{g(Y,Z)X - g(X,Z)Y\}$.

We now assume the following

(3.14) $\tilde{C}(X,Y,Z) = g(\bar{C}(X,Y,Z),u)$.

Using (3.14) in (3.13), we get

(3.15) $\tilde{C}(X,Y,Z,u) = \tilde{C}(X,Y,Z,u) + \omega(\rho)\{g(Y,Z)g(X,u) - g(X,Z)g(Y,u)\}$.

We now put bars in (3.15) and thereafter use (1.2) and (1.12a), we respectively get

(3.16) $\tilde{C}(\bar{X},\bar{Y},\bar{Z},\bar{u}) = \tilde{C}(X,Y,Z,u)$

and

(3.17) $\tilde{C}(X,Y,\bar{Z},\bar{u}) = \tilde{C}(\bar{X},\bar{Y},Z,u)$.

We can therefore state:

Theorem (3.2):

The concircular curvature tensor $\widetilde{C}(X,Y,Z)$ with respect to semi-symmetric metric connection $\widetilde{\nabla}$ respectively satisfies (3.15), (3.16) and (3.17).

The Conharmonic curvature tensor $\tilde{L}(X,Y,Z)$ admitting semi-symmetric metric connection $\widetilde{\nabla}$ is defined as

(3.18) $\tilde{L}(X,Y,Z) = \widetilde{K}(X,Y,Z) - \frac{1}{n-2}\{\widetilde{Ric}.(Y,Z)X - \widetilde{Ric}.(X,Z)Y + g(Y,Z)\tilde{R}X - g(X,Z)\tilde{R}Y\}$.

From (2.10), we get

(3.19) $\tilde{R}X = RX + (n-1)\omega(\rho)X$,

where $\tilde{R}X$ is obtained by contracting Ric. which is Ricci tensor with respect to semi-symmetric metric connection $\tilde{\nabla}$.

Using (2.10), (3.2) and (3.19) in (3.18), we get

(3.20) $\tilde{L}(X,Y,Z) = K(X,Y,Z) + \frac{1}{n-2}\{Ric.(Y,Z)X - Ric.(X,Z)Y\} + \{g(Y,Z)RX - g(X,Z)RY\} - \frac{n-1}{n-2}\{\omega(\rho)g(Y,Z)X - \omega(\rho)g(X,Z)Y\} - \frac{n-1}{n-2}\{\omega(\rho)g(X,Z)Y - \omega(\rho)g(Y,Z)X\}.$

After allowing a suitable rearrangement in (3.20), we get the following

(3.21) $\tilde{L}(X,Y,Z) = L(X,Y,Z) - 2\omega(\rho)\left(\frac{n-1}{n-2}\right)\{g(Y,Z)X - g(X,Z)Y\}.$

Let us write $\tilde{L}(X,Y,Z,u) = g(\tilde{L}(X,Y,Z),u)$ then from (3.21), we get

(3.22) $\tilde{L}(X,Y,Z,u) = L(X,Y,Z,u) -$
$- 2\omega(\rho)\left(\frac{n-1}{n-2}\right)\{g(Y,Z)g(X,u) - g(X,Z)g(Y,u)\}.$

Barring X,Y,Z,u in (3.22) and thereafter using (1.14a) and (2.2), we get

(3.23) $\tilde{L}(\bar{X},\bar{Y},\bar{Z},\bar{u}) = L(X,Y,Z,u).$

Again barring X,Y in (3.23) and then using (1.14b), we get

(3.24) $\tilde{L}(\bar{X},\bar{Y},Z,u) = \tilde{L}(X,Y,\bar{Z},\bar{u}).$

with all such observations, we can thereafter state:

Theorem (3.3):

The Conharmonic curvature tensor $\tilde{L}(X,Y,Z)$ equipped with semi-symmetric metrics connection $\tilde{\nabla}$ always satisfies (3.23) and (3.24) respectively.

4. H- PROJECTIVE CURVATURE TENSOR:

The H-projective curvature tensor $\tilde{P}(X,Y,Z)$ is defined by

(4.1) $2\tilde{P}(X,Y,Z) = 2\tilde{K}(X,Y,Z) - \frac{1}{n+1}\{\widetilde{Ric}.(Y,Z)X - \widetilde{Ric}.(X,Z)Y + \widetilde{Ric}.(Y,\bar{Z})\bar{X} + \widetilde{Ric}.(X,\bar{Z})\bar{Y} + 2\widetilde{Ric}.(Y,\bar{Y})\bar{Z}\}.$

We now write

(4.2) $\tilde{P}(X,Y,Z,u) = g(\tilde{P}(X,Y,Z),u)$

Using (4.2) in (4.1), we get

(4.3) $2\tilde{P}(X,Y,Z,u) = 2\tilde{K}(X,Y,Z,u) - \frac{1}{n+1}\{\widetilde{Ric}.(Y,Z)g(X,u) - \widetilde{Ric}.(X,Z)g(Y,u) - \widetilde{Ric}.(Y,\bar{Z})g(\bar{X},u) + \widetilde{Ric}.(X,\bar{Z})g(\bar{Y},u) - 2\widetilde{Ric}.(Y,\bar{Y})g(\bar{Z},u)\}.$

Using (2.12) and (3.2) in (4.3), we get

(4.4) $2\tilde{P}(X,Y,Z,u) = 2K(X,Y,Z,u) + \omega(\rho)\{g(Y,Z)g(X,u) - g(X,Z)g(Y,u)\} - \frac{1}{n+4}[g(X,u)Ric.(Y,Z) - g(Y,u)Ric.(X,Z) + (n-1)\omega(\rho)\{g(Y,Z)g(X,u) - g(Y,u)g(X,Z)\} - g(\bar{X},u)Ric.(Y,\bar{Z}) - (n-1)\omega(\rho)g(Y,\bar{Z})g(\bar{X},u) + g(\bar{Y},u)Ric.(X,\bar{Z}) + (n-1)\omega(\rho)g(X,\bar{Z})g(\bar{Y},u) + 2g(\bar{Z},u)Ric.(X,\bar{Y}) + 2(n-1)\omega(\rho)g(\bar{Z},u)g(X,\bar{Y})].$

Using (1.15) in (4.4), we get

(4.5) $2\tilde{P}(X,Y,Z,u) = 2K(X,Y,Z,u) - \frac{1}{n+1}\{g(X,u)Ric.(Y,Z) - g(Y,u)Ric.(X,Z) - -g(\bar{X},u)Ric.(Y,\bar{Z}) + g(\bar{Y},u)Ric.(X,\bar{Z}) + 2g(\bar{Z},u)Ric.(X,\bar{Y})\}.$

Using (4.5) in (4.4), we get

(4.6) $2\tilde{P}(X,Y,Z,u) = 2P(X,Y,Z,u) + \frac{2\omega(\rho)}{n+1}\{g(Y,Z)g(X,u) - g(X,Z)g(Y,u)\} + \omega(\rho)\left(\frac{n-1}{n+1}\right)\{g(\bar{Y},u)g(X,\bar{Z}) - g(Y,\bar{Z})g(\bar{X},u) + 2g(\bar{Z},u)g(X,\bar{Y})\}.$

Barring X and Y in (4.6), we get

(4.7) $$2\tilde{P}(\bar{X},\bar{Y},Z,u) = 2P(\bar{X},\bar{Y},Z,u) + \frac{2\omega(\rho)}{n+1}[g(\bar{Y},Z)g(\bar{X},u) - g(\bar{X},Z)g(\bar{Y},u)] + \omega(\rho)\left(\frac{n-1}{n+1}\right)[-g(Y,u)g(X,Z) + g(Y,Z)g(X,u) - 2g(\bar{Z},u)g(\bar{X},Y)].$$

Allowing a cyclic interchange of X, Y, Z in (4.7), we get

(4.8) $$2\tilde{P}(\bar{Y},\bar{Z},X,u) = 2P(\bar{Y},\bar{Z},X,u) + \frac{2\omega(\rho)}{n+1}[g(\bar{Z},X)g(\bar{Y},u) - g(\bar{Y},X)g(\bar{Z},u)] + \omega(\rho)\left(\frac{n-1}{n+1}\right)[g(X,Z)g(Y,u) - g(Z,u)g(Y,X) - 2g(\bar{X},u)g(\bar{Y},Z)].$$

and

(4.9) $$2\tilde{P}(\bar{Z},\bar{X},Y,u) = 2P(\bar{Z},\bar{X},Y,u) + \frac{2\omega(\rho)}{n+1}[g(\bar{X},Y)g(\bar{Z},u) - g(\bar{Z},Y)g(\bar{X},u)] + \omega(\rho)\left(\frac{n-1}{n+1}\right)[g(X,Y)g(Z,u) - g(X,u)g(Z,Y) - 2g(\bar{Y},u)g(\bar{Z},X)].$$

Adding (4.7), (4.8) and (4.9) and thereafter using (1.2) and (1.16), we respectively get the following

(4.10) $$\tilde{P}(\bar{X},\bar{Y},Z,u) + \tilde{P}(\bar{Y},\bar{Z},X,u) + \tilde{P}(\bar{Z},\bar{X},Y,u) = g(X,\bar{Z})g(\bar{Y},u) + g(Y,\bar{X})g(\bar{Z},u) + g(\bar{Z},Y)g(\bar{X},u)$$

and

(4.11) $$\tilde{P}(X,Y,\bar{Z},\bar{u}) + \tilde{P}(Y,Z,\bar{X},\bar{u}) + \tilde{P}(Z,X,\bar{Y},\bar{u}) = g(\bar{X},Z)g(Y,\bar{u}) + g(\bar{Y},X)g(Z,\bar{u}) + g(\bar{Z},Y)g(X,\bar{u}).$$

In the light of all these observations, we can therefore state:

Theorem (4.1):

The H-projective curvature tensor $\tilde{P}(X,Y,Z)$ admitting semi-symmetric metric connection $\tilde{\nabla}$ respectively satisfies (4.10) and (4.11).

Conclusion:

The first section of this communication is introductory in nature. In the second section we have established the relationships which are satisfied by the semi-symmetric curvature tensor $\tilde{K}$ with respect to the semi-symmetric metric connection. In the third section we have established the relationships which are satisfied by Weyl's projective curvature tensor $\tilde{W}$, the concircular curvature tensor $\tilde{C}$ and the conharmonic curvature tensor $\tilde{L}$ all equipped with semi-symmetric metric connection. In the fourth and last section we have established the relationships which are satisfied by the H-projective curvature tensor $\tilde{P}$ equipped with semi-symmetric metric connection.

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