Chatterjea Type Fixed-Point Results on S-Metric Spaces

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Abstract: - In this paper, we investigate new fixed-point results within the framework of S-metric spaces, which provide a significant generalization of classical metric spaces. We introduce and utilize a Chatterjea type contractive condition involving altering distance functions, denoted by Φ, to establish the existence and uniqueness of fixed points. Specifically, we prove two primary theorems: the first considers self-mappings on T-orbitally compact S-metric spaces where the mapping is orbitally continuous, and the second extends these results to boundedly compact S-metric spaces. To support our theoretical findings, we provide illustrative examples of S-metrics that are not generated by any traditional metric, demonstrating the broader applicability of our results. Additionally, we present corollaries that translate these findings into the context of b-metric spaces generated by S-metrics.

Key-Words: - fixed point, S-metric space, Chatterjea type contraction, orbitally compact, orbitally continuous, boundedly compact.

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1 Introduction

The study of fixed point theory has undergone significant expansion through the generalization of the metric space structure. One such notable generalization is the concept of S-metric spaces, introduced to provide a more versatile framework than traditional metric spaces [1]. In an S-metric space, the distance function is defined on three elements of a set, satisfying specific axioms that allow for a broader range of mathematical applications. While every metric space can induce an S-metric, there exist various S-metrics in the literature that cannot be generated by any classical metric [2-4]. This distinction makes the investigation of fixed point theorems within the S-metric framework both meaningful and significant. On the other hand, there are a lot of studies on different generalized metric spaces (for example, see [5] and the references therein)

Parallel to the structural generalizations of spaces, researchers have also focused on refining contractive conditions. Khan et al. introduced the notion of altering distance functions to extend classical contraction principles [6]. These continuous, monotonically increasing functions, which vanish only at the origin, serve as effective tools for formulating generalized contractive conditions. Furthermore, the study of fixed points often requires specific topological properties such as orbital continuity and orbital compactness. These notions, originally developed in the context of metric spaces, can be handled in an analogous manner within S-metric spaces.

The primary motivation of this research is to establish new fixed point results by combining the structural advantages of S-metric spaces with Chatterjea type contractive conditions [7], inspired by the theorems proved in [8]. By utilizing altering distance functions and considering properties such as T-orbital compactness and bounded compactness, we aim to prove the existence and uniqueness of fixed points for a class of self-mappings. The results presented herein not only generalize existing theorems in the literature but also provide new insights into the relationship between S-metrics and generated b-metrics.

2 Preliminaries

In this section, we recall some basic notions related to the S-metric spaces.

Definition 2.1. [1] Let X be a nonempty set and $S: X^3 \to [0,\infty)$ be a function satisfying the following conditions for all $x,y,z,w \in X$:

(S1) $S(x,y,z)=0 \Leftrightarrow x=y=z$,
(S2) $S(x,y,z) \le S(x,x,w)+S(y,y,w)+S(z,z,w)$.

Then S is called an S-metric and the pair (X,S) is called an S-metric space.

Lemma 2.2. [1] Let (X,S) be an S-metric space and $x,y \in X$. Then we have

$$S(x,x,y)=S(y,y,x).$$

Definition 2.3. [1] Let (X,S) be an S-metric space and $\{x_n\}$ be a sequence in X .

(1) A sequence $\{x_n\}$ converges to $z \in X$ if

$$S(x_n,x_n,z) \to 0$$

as $n \to \infty$, that is, for each $\varepsilon > 0$, there exists $n_0 \in \mathbb{N}$ such that for all $n \ge n_0$ we have

$$S(x_n,x_n,z) < \varepsilon .$$

(2) A sequence $\{x_n\}$ is a Cauchy sequence if

$$S(x_n,x_n,x_m) \to 0$$

as $n,m \to \infty$, that is, for each $\varepsilon > 0$, there exists $n_0 \in \mathbb{N}$ such that for all $n,m \ge n_0$ we have

$$S(x_n,x_n,x_m) < \varepsilon .$$

(3) The S-metric space is complete if every Cauchy sequence is a convergent sequence.

The relationship between a metric and an S-metric has been addressed in detail across a variety of sources [2-4]. The definition of the S-metric induced by a metric is defined as follows:

Let (X,d) be a metric space. Then the function $S_d : X^3 \to [0,\infty)$ defined by

$$S_d(x,y,z)=d(x,z)+d(y,z),$$

for all $x,y,z \in X$ is an S-metric on X . The S-metric S_d is called the S-metric generated by d .

There are various examples of S-metrics in literature that cannot be generated by a metric. For this reason, addressing a problem in an S-metric space rather than a metric space becomes both meaningful and significant. This constitutes the primary motivation for conducting our study in the framework of S-metric spaces.

Furthermore, the relationship between the S-metric structure and the b-metric structure, which is another generalization of metric spaces, is given in the following theorem.

Theorem 2.4. [9] Let (X,S) be an S-metric space and

$$d^S(x,y)=S(x,x,y),$$

for all $x,y \in X$. Then we have

(1) d^S is a b-metric on X ,
(2) $x_n \to x$ in (X,S) if and only if $x_n \to x$ in (X,d^S),
(3) $\{x_n\}$ is a Cauchy sequence in (X,S) if and only if $\{x_n\}$ is a Cauchy sequence in (X,d^S).

The b-metric d^S is called the b-metric generated by S .

Definition 2.5. Let (X,d) be a metric space (or (X,S) be an S-metric space) and $T: X \to X$ be a self-mapping.

(1) X is called boundedly compact if every bounded sequence has a convergent subsequence [10].

(2) T is called orbitally continuous at a point if the limit of the orbit implies the continuity of the mapping at this limit point [11].

(3) X is called T-orbitally compact if every sequence in $O_x(T)$ has a convergent subsequence for each $x \in X$, where the set $O_x(T)$ is the orbit of x under T [12].

These notions can be handled in an analogous manner in the context of S-metric spaces (for example, see [13]).

In 1984, Khan et al. introduced altering distance functions to generalize classical fixed-point results [6]. These are continuous mappings from the set of non-negative reals to itself that are strictly monotonic and equal to zero if and only if the argument is zero. By providing an alternative framework for distance measurement, they have become a standard tool in formulating expansive contractive conditions. We denote the collection of these functions satisfying the sub-additivity condition as Φ.

3 Main Results

In this section, we prove two fixed-point theorems on S-metric spaces using the Chatterjea type contraction.

Theorem 3.1. Let (X,S) be an S-metric space and $T: X \to X$ be a self-mapping satisfying

$$(C_\phi)\ \ \phi\big(S(Tx,Tx,Ty)\big) < \frac{1}{3}\begin{bmatrix}\phi\big(S(x,x,Ty)\big)\\ +\phi\big(S(y,y,Tx)\big)\end{bmatrix},$$

for each $x, y \in X$, $x \neq y$ and for some $\phi \in \Phi$. If X is T-orbitally compact and T is orbitally continuous, then T has a unique fixed point $z \in X$.

Proof. Let $x_0 \in X$ be any arbitrary point and a sequence $\{x_n\}$ be defined by

$$x_n = Tx_{n-1} = T^n x_0,$$

for each $n \in \mathbb{N}$. If there exists $n_0 \in \mathbb{N}$ such that

$$x_{n_0+1} = x_{n_0},$$

then the proof is completed. Assume that

$$x_{n-1} \neq x_n,$$

for each $n \in \mathbb{N}$. Then, we have $S(x_{n-1}, x_{n-1}, x_n) > 0$. By (C_ϕ), we obtain

$$\begin{aligned}\phi\big(S(x_n,x_n,x_{n+1})\big) &< \frac{1}{3}\begin{bmatrix}\phi\big(S(x_{n-1},x_{n-1},Tx_n)\big)\\ +\phi\big(S(x_n,x_n,Tx_{n-1})\big)\end{bmatrix}\\ &= \frac{1}{3}\phi\big(S(x_{n-1},x_{n-1},x_{n+1})\big)\\ &\leq \frac{1}{3}\Big[2\phi\big(S(x_{n-1},x_{n-1},x_n)\big)+\phi\big(S(x_n,x_n,x_{n+1})\big)\Big].\end{aligned}$$

Suppose that

$$S(x_{n-1},x_{n-1},x_n) \leq S(x_n,x_n,x_{n+1}),$$

for $n \geq 1$ and so we get

$$\phi\big(S(x_n,x_n,x_{n+1})\big) < \phi\big(S(x_n,x_n,x_{n+1})\big),$$

a contradiction. It should be

$$S(x_n,x_n,x_{n+1}) \leq S(x_{n-1},x_{n-1},x_n)$$

and so

$$\phi\big(S(x_n,x_n,x_{n+1})\big) < \phi\big(S(x_{n-1},x_{n-1},x_n)\big),$$

for each $n \in \mathbb{N}$. Therefore, $\{S(x_n,x_n,x_{n+1})\}$ and $\{\phi(S(x_n,x_n,x_{n+1}))\}$ are non-increasing sequences of positive real numbers. They are bounded and converge to their respective infima. Since X is T-orbitally compact, $\{x_n\}$ has a convergent subsequence $\{x_{n_k}\}$ which converges to $z \in X$ such that

$$\lim_{k\to\infty} x_{n_k} = z.$$

Since T is orbitally continuous, we get

$$\lim_{k\to\infty} Tx_{n_k} = Tz$$

and

$$\lim_{k\to\infty} T^2 x_{n_k} = T^2 z.$$

To show that z is a fixed point of T, on the contrary, we assume that

$$z \neq Tz.$$

By (C_ϕ), we obtain

$$\phi\left(S\left(Tz,Tz,T^2z\right)\right) < \frac{1}{3}\begin{bmatrix}\phi\left(S\left(z,z,Tz\right)\right)\\ +\phi\left(S\left(Tz,Tz,Tz\right)\right)\end{bmatrix}$$
$$= \frac{1}{3}\phi\left(S\left(z,z,Tz\right)\right).$$

Using the continuity of S, we get

$$\lim_{k\to\infty} S\left(x_{n_k}, x_{n_k}, x_{n_{k+1}}\right) = S\left(z,z,Tz\right)$$

and

$$\lim_{k\to\infty} S\left(x_{n_{k+1}}, x_{n_{k+1}}, x_{n_{k+2}}\right) = S\left(Tz,Tz,T^2z\right).$$

Hence, we have

$$\lim_{k\to\infty} \phi\left(S\left(x_{n_k}, x_{n_k}, x_{n_{k+1}}\right)\right) = \phi\left(S\left(z,z,Tz\right)\right)$$

and

$$\lim_{k\to\infty} \phi\left(S\left(x_{n_{k+1}}, x_{n_{k+1}}, x_{n_{k+2}}\right)\right) = \phi\left(S\left(Tz,Tz,T^2z\right)\right).$$

Since $\left\{\phi\left(S\left(x_n, x_n, x_{n+1}\right)\right)\right\}$ is convergent, we obtain

$$\phi\left(S\left(z,z,Tz\right)\right) = \phi\left(S\left(Tz,Tz,T^2z\right)\right),$$

a contradiction. It should be $z = Tz$. Finally, we prove that z is a unique fixed point of T. For this purpose, we suppose that there exist two fixed points $z, w \in X$ with $z \neq w$. By (C_ϕ), we get

$$\phi\left(S\left(z,z,w\right)\right) = \phi\left(S\left(Tz,Tz,Tw\right)\right)$$
$$< \frac{1}{3}\left[\phi\left(S\left(z,z,Tw\right)\right) + \phi\left(S\left(w,w,Tz\right)\right)\right]$$
$$= \frac{2}{3}\phi\left(S\left(z,z,w\right)\right),$$

a contradiction. Consequently, T has a unique fixed point z in X. □

Example 3.2. Let $X = \{0,1,2,4\} \cup (6,8]$ be an S-metric space with the S-metric $S: X^3 \to [0,\infty)$ defined as

$$S\left(x,y,z\right) = |x-z| + |x+z-2y|,$$

for all $x, y, z \in X$ [4]. This S-metric is not generated by any metric. Let us define the self-mapping $T: X \to X$ by

$$Tx = \begin{cases} 1 & , \quad x \in X - \{8\} \\ 0 & , \quad x = 8 \end{cases},$$

for all $x \in X$. Then X is T-orbitally compact and T is orbitally continuous. Let us take $\phi \in \Phi$ such that

$$\phi(t) = t,$$

for each $t \geq 0$. Now, we consider the following cases:

Case I: If $x, y \in X - \{8\}$ with $x \neq y$, then we have

$$0 = S\left(Tx,Tx,Ty\right)$$
$$< \frac{1}{3}\left[S\left(x,x,Ty\right) + S\left(y,y,Tx\right)\right].$$

Case II: If $x \in X - \{8\}$ and $y = 8$, then we have

$$2 = S\left(Tx,Tx,Ty\right) < \frac{14}{3}$$
$$\leq \frac{1}{3}\left[S\left(x,x,Ty\right) + S\left(y,y,Tx\right)\right].$$

Case III: If $y \in X - \{8\}$ and $x = 8$, then we have

$$2 = S\left(Tx,Tx,Ty\right) < \frac{14}{3}$$
$$\leq \frac{1}{3}\left[S\left(x,x,Ty\right) + S\left(y,y,Tx\right)\right].$$

Consequently, T satisfies the conditions of Theorem 3.1 and so T has a unique fixed point $x = 1$.

Theorem 3.3. Let (X,S) be an S-metric space and $T: X \to X$ be a self-mapping satisfying the

condition (C_ϕ). If X is boundedly compact and T is orbitally continuous, then T has a unique fixed point $z \in X$.

Proof. Let $x_0 \in X$ be any arbitrary point and a sequence $\{x_n\}$ be defined by

$$x_n = Tx_{n-1} = T^n x_0,$$

for each $n \in \mathbb{N}$. If there exists $n_0 \in \mathbb{N}$ such that

$$x_{n_0+1} = x_{n_0},$$

then the proof is completed. Assume that

$$x_{n-1} \neq x_n,$$

for each $n \in \mathbb{N}$. Then, we have $S(x_{n-1}, x_{n-1}, x_n) > 0$. By (C_ϕ), we obtain

$$\begin{aligned}\phi\left(S\left(x_n, x_n, x_{n+1}\right)\right) &< \frac{1}{3}\left[\begin{array}{l}\phi\left(S\left(x_{n-1}, x_{n-1}, Tx_n\right)\right) \\ +\phi\left(S\left(x_n, x_n, Tx_{n-1}\right)\right)\end{array}\right] \\ &= \frac{1}{3}\phi\left(S\left(x_{n-1}, x_{n-1}, x_{n+1}\right)\right) \\ &\leq \frac{1}{3}\left[2\phi\left(S\left(x_{n-1}, x_{n-1}, x_n\right)\right) + \phi\left(S\left(x_n, x_n, x_{n+1}\right)\right)\right].\end{aligned}$$

Suppose that

$$S\left(x_{n-1}, x_{n-1}, x_n\right) \leq S\left(x_n, x_n, x_{n+1}\right),$$

for $n \geq 1$ and so we get

$$\phi\left(S\left(x_n, x_n, x_{n+1}\right)\right) < \phi\left(S\left(x_n, x_n, x_{n+1}\right)\right),$$

a contradiction. It should be

$$S\left(x_n, x_n, x_{n+1}\right) \leq S\left(x_{n-1}, x_{n-1}, x_n\right)$$

and so

$$\phi\left(S\left(x_n, x_n, x_{n+1}\right)\right) < \phi\left(S\left(x_{n-1}, x_{n-1}, x_n\right)\right),$$

for each $n \in \mathbb{N}$. Therefore, $\{S(x_n, x_n, x_{n+1})\}$ and $\{\phi(S(x_n, x_n, x_{n+1}))\}$ are non-increasing sequences of positive real numbers. They are bounded and converge to their respective infima. By the monotonicity of $\{S(x_n, x_n, x_{n+1})\}$ and $\{\phi(S(x_n, x_n, x_{n+1}))\}$, we get

$$\begin{aligned}S\left(x_n, x_n, x_{n+1}\right) &< S\left(x_{n-1}, x_{n-1}, x_n\right) \\ &< S\left(x_{n-2}, x_{n-2}, x_{n-1}\right) \\ &\vdots \\ &< S\left(x_0, x_0, x_1\right) \\ &= K.\end{aligned}$$

For any $n, m \in \mathbb{N}$, let us define

$$\mathsf{B} = \left\{S\left(x_n, x_n, x_m\right) : n, m \geq 1\right\}.$$

Suppose that B is not bounded. Then, we have

$$\limsup_{n,m\to\infty} S\left(x_n, x_n, x_m\right) = \infty.$$

For $n < m$, we get

$$\begin{aligned}S\left(x_n, x_n, x_m\right) &= S\left(x_n, x_n, x_{n+r}\right) \\ &\leq 2S\left(x_n, x_n, x_{n+1}\right) + 2S\left(x_{n+1}, x_{n+1}, x_{n+2}\right) \\ &+ \ldots + 2S\left(x_{n+r-1}, x_{n+r-1}, x_{n+r}\right) \\ &\leq 2rK\end{aligned}$$

and taking limsup as $n, m \to \infty$, we have

$$\begin{aligned}\infty &= \limsup_{n,m\to\infty} S\left(x_n, x_n, x_m\right) \\ &\leq 2rK < \infty,\end{aligned}$$

a contradiction. Therefore, B is bounded and $\{x_n\}$ is a bounded sequence in X. Since X is boundedly compact, the sequence $\{x_n\}$ has a subsequence which converges $z \in X$ such that

$$\lim_{k\to\infty} x_{n_k} = z.$$

Since T is orbitally continuous, we get

$$\lim_{k\to\infty} Tx_{n_k} = Tz.$$

By a similar approach used in the proof of Theorem 3.1, we prove that T has a unique fixed point z in X. □

Example 3.4. Let $X = \square$ be the S-metric space with the S-metric defined as in Example 3.2. Let us define the self-mapping $T : X \to X$ as

$$Tx = \begin{cases} \frac{1}{6} & , \quad x \le 6 \\ 0 & , \quad x > 6 \end{cases}.$$

Then X is boundedly compact and T is orbitally continuous. Let us take $\phi \in \Phi$ such that

$$\phi(t) = t,$$

for each $t \ge 0$. Now, we consider the following cases:

Case I: If $x, y \le 6$ or $x, y > 6$, then we have

$$\begin{aligned} 0 &= S(Tx, Tx, Ty) \\ &< \frac{1}{3}\left[S(x, x, Ty) + S(y, y, Tx) \right]. \end{aligned}$$

Case II: If $x \le 6$ and $y > 6$, then we have

$$\begin{aligned} &\frac{1}{3}\left[S(x, x, Ty) + S(y, y, Tx) \right] \\ &= \frac{1}{3}\left[2|x| + 2\left| y - \frac{1}{6} \right| \right] \\ &\ge \frac{1}{3}\left[2|x| + 2\left(y - \frac{1}{6} \right) \right] \\ &> \frac{1}{3}\left[2|x| + 2y \right] > 4 > \frac{1}{3} \\ &= 2\left| \frac{1}{6} - 0 \right| \\ &= S(Tx, Tx, Ty). \end{aligned}$$

Case III. If $y \le 6$ and $x > 6$, then the condition (C_ϕ) is satisfied like *Case II*.

Consequently, the conditions of Theorem 3.3 are satisfied and T has a unique fixed point $x = \frac{1}{6}$.

Corollary 3.5. Let (X, d^S) be a b-metric space and $T : X \to X$ be a self-mapping satisfying

$$(C^*_\phi) \quad \phi\left(d^S(Tx, Ty)\right) < \frac{1}{3}\left[\begin{matrix} \phi\left(d^S(x, Ty)\right) \\ +\phi\left(d^S(y, Tx)\right) \end{matrix} \right],$$

for each $x, y \in X$, $x \ne y$ and for some $\phi \in \Phi$. If X is T-orbitally compact and T is orbitally continuous, then T has a unique fixed point $z \in X$.

Corollary 3.6. Let (X, d^S) be a b-metric space and $T : X \to X$ be a self-mapping satisfying the condition (C^*_ϕ). If X is boundedly compact and T is orbitally continuous, then T has a unique fixed point $z \in X$.

4 Conclusion and Future Works

In this research, we have successfully established new fixed-point theorems for Chatterjea type contractions within the framework of S-metric spaces. By incorporating altering distance functions and utilizing the properties of T-orbital compactness and bounded compactness, we have provided conditions under which a self-mapping possesses a unique fixed point. The examples presented demonstrate that our results are applicable even in S-metric spaces that are not generated by traditional metrics, highlighting the independence and significance of the S-metric structure. Furthermore, the corollaries derived for b-metric spaces illustrate the versatility of the S-metric approach in connecting different generalized metric structures.

In the literature, there are some studies related to the generalization of Chatterjea type fixed-point results (for example, see [14-16] and the references therein). Building upon and going beyond the aforementioned studies, this paper makes a novel contribution to the literature on fixed point theory in S-metric spaces. Specifically, we introduce and employ the concepts of orbital compactness, orbital continuity, and bounded compactness to establish new Chatterjea-type fixed point theorems under appropriate contractive conditions. Our results provide a distinct theoretical framework for investigating Chatterjea-type contractions in S-metric spaces and substantially broaden the existing scope of fixed-point theory in this setting. Thus, the present study advances the literature by establishing new connections between these topological properties and the existence of fixed points, thereby opening new avenues for further research.

For future research, the contractive conditions explored in this paper could be extended to common fixed-point results for pairs or families of mappings. Additionally, the study of these concepts can be further generalized by considering different types of spaces, such as S_b-metric spaces or fuzzy S-metric spaces. Another promising direction involves investigating the application of these fixed-point results in solving nonlinear integral equations or related problems in functional analysis where the S-metric structure provides a more natural setting than classical metrics.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) utilized artificial intelligence (AI) technologies solely for the purpose of linguistic refinement and grammatical correction. Following the application of these tools, the author(s) comprehensively reviewed, verified, and edited the resulting text. The author(s) maintain full accountability and responsibility for the accuracy, integrity, and final content of the publication.

References:

[1] S. Sedghi, N. Shobe and A. Aliouche, A generalization of fixed point theorems in S-metric spaces, Mathematicki Vesnik, Vol.64, No.3, 2012, pp. 258-266.

[2] A. Gupta, Cyclic contraction on S-metric space, International Journal of Analysis and Applications, Vol.3, No. 2, 2013, pp.119-130.

[3] N. T. Hieu, N. T. Ly and N. V. Dung, A generalization of Ciric quasi-contractions for maps on S-metric spaces, Thai Journal of Mathematics, Vol.13, No.2, 2015, pp.369-380.

[4] N. Y. Özgür and N. Taş, Some new contractive mappings on S-metric spaces and their relationships with the mapping (S25), Mathematical Sciences, Vol.11, No.1, 2017, pp.7-16.

[5] R. Sharma, D. Thakur and K. Al Maqbali, Complex valued dislocated metric space and related fixed point theorems, WSEAS Transactions on Mathematics, Vol.24, 2025, pp.635-639.

[6] M. S. Khan, M. Swaleh and S. Sessa, Fixed point theorems by altering distances between the points, Bulletin of the Australian Mathematical Society, Vol.30, 1984, pp.1-9.

[7] S. K. Chatterjea, Fixed point theorems, Comptes Rendus de I'Academie Bulgare des Sciences, Vol.25, 1972, pp.727-730.

[8] I. S. Singh and Y. M. Singh, Some fixed point theorems on Chatterjea type contractions, Applications and Applied Mathematics: An International Journal (AAM), Vol.21, No.3, 2026, pp.1-20.

[9] S. Sedghi and N. V. Dung, Fixed point theorems on S-metric spaces, Mathematicki Vesnik, Vol.66, No.1, 2014, pp.113-124.

[10] R. E. Edwards, Functional Analysis: Theory and Applications, Holt, Rinehart and Winston, New York, 1965.

[11] Lj. B. Ciric, On contraction type mappings, Mathematica Balkanica, Vol.1, 1971, pp.52-57.

[12] H. Garai, L. K. Dey and T. Senapati, On Kannan-type contractive mappings, Numerical Functional Analysis and Optimization, Vol.39, No.13, 2018, pp.1466-1476.

[13] N. Taş and N. Y. Özgür, Common fixed points of continuous mappings on S-metric spaces, Mathematical Notes, Vol.104, 2018, pp.587-600.

[14] M. Din, U. Ishtiaq, M. Mukhtar, S. Sessa and H. A. Ghazwani, On generalized Sehgal–Guseman-Like contractions and their fixed-point results with applications to nonlinear fractional differential equations and boundary value problems for homogeneous transverse bars, Mathematics, Vol.12, No.4, 2024, 541.

[15] G. V. R. Babu, P. Durga Sailaja and G. Srichandana, Strong coupled fixed points of Chatterjea type -weakly cyclic coupled mappings in S-metric spaces, Proceedings of International Mathematical Sciences, Vol.2, No.1, 2020, 60-78.

[16] G. Siva and S. Loganathan, Weak convergence of fixed point iterations in S-metric spaces, Journal of Mahani Mathematical Research, Vol.13, No.1, 2024, 563-574.

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