*Dedicated to Prof. Billy E. Rhoades on the occasion of his* 90<sup>th</sup> *anniversary* 

## Caristi type fixed point theorems using Száz principle in quasi-metric spaces

## M. AAMRI<sup>1</sup>, K. CHAIRA<sup>1</sup>, S. LAZAIZ<sup>2</sup> and EL-M. MARHRANI<sup>1</sup>

## Abstract.

In this paper, we use Száz maximum principle to prove generalizations of Caristi fixed point theorem in a preordered *K*-complete quasi metric space. Examples are given to support our results.

**Acknowledgements.** The authors are grateful to the editor and the referees for carefully reading the paper and pointing out some mistakes in the first draft of it. Their comments were helpful to improve the quality of this article.

## REFERENCES

- Ali-Akbari, M., Honari, B., Pourmahdian, M. and Rezaii, M. M., The space of formal balls and models of quasimetric spaces, Math. Structures Comput. Sci., 19 (2009), No. 2, 337–355
- [2] Altman, M., A generalization of the Brézis-Browder principle on ordered sets, Nonlinear Analysis: Theory, Methods & Applications, 6 (1982), No. 2, 157–165
- [3] Brézis H. and Browder, F. E., A general principle on ordered sets in nonlinear functional analysis, Advances in Math., 21 (1976), No. 3, 355–364
- [4] Caristi, J., Fixed point theorems for mappings satisfying inwardness conditions, Trans. Amer. Math. Soc., 215 (1976), 241–251
- [5] Cobzaş S., Completeness in quasi-metric spaces and Ekeland variational principle, Topology Appl., 158 (2011), No. 8, 1073–1084
- [6] Gaba, Y. U., An order theoretic approach in fixed point theory, Math. Sci. (Springer), 8 (2014), No. 3, 87–93
- [7] Karapinar, K. and Romaguera, S., On the weak form of Ekeland's Variational Principle in quasi-metric spaces, Topology Appl., 2015 (2105), No. 184, 54–60
- [8] Kirk, W. A. and Saliga, L. M., The Brézis-Browder order principle and extensions of Caristi's theorem, Nonlinear Analysis: Theory, Methods & Applications, 47 (2001), No. 4, 2765–2778
- [9] Lazaiz, S., Chaira, K., Aamri, M. and Marhrani, El-M., Some remarks on Caristi type fixed point theorem, International Journal of Pure and Applied Mathematics, 104 (2015), No. 4, 585–597
- [10] Romaguera, S. and Tirado, P., A characterization of Smyth complete quasi-metric spaces via Caristi's fixed point theorem, Fixed Point Theory Appl., 2015 (2015), No. 1, 1–13
- [11] Reilly, I. L., Subrahmanyam, P. V. and Vamanamurthy, M. K., Cauchy sequences in quasi-pseudo-metric spaces, Monatshefte for Mathematik, 93 (1982), No. 2, 127–140
- [12] Száz, Á., An improved Altman type generalization of the Brézis-Browder ordering principle, Math. Commun., 12 (2007), No. 2, 155–161
- [13] Turinici, M., A generalization of Altman's ordering principle, Proc. Amer. Math. Soc., 90 (1984), No. 2, 128–132
- [14] Wilson, W. A., On quasi-metric spaces, Amer. J. Math., 53 (1931), No. 3, 675-684

Received: 11.03.2019; In revised form: 02.06.2020; Accepted: 09.06.2020 2010 Mathematics Subject Classification. 47H10, 54E99. Key words and phrases. Caristi's theorem, quasi metric spaces, fixed point, maximal principle.

Key words and phrases. *Caristi's theorem, quasi metric spaces, fixed point, maximal principl* Corresponding author: EL-M. Marhrani; elmarhrani@yahoo.fr

<sup>1</sup>LABORATORY OF ALGEBRA ANALYSIS AND APPLICATIONS (L3A) HASSAN II UNIVERSITY OF CASABLANCA FACULTY OF SCIENCES BEN M'SIK AVENUE DRISS EL HARTI, B. P 7955, SIDI OTHMANE, CASABLANCA, MOROCCO *Email address*: aamrimohamed9@yahoo.fr *Email address*: chaira\_karim@yahoo.fr *Email address*: elmiloudi.marhrani@univh2c.ma

<sup>2</sup>DEPARTMENT OF MATHEMATICS LASMA LABORATORY FACULTY OF SCIENCES DHAR EL MAHRAZ UNIVERSITY SIDI MOHAMED BEN ABDELLAH, FES, MOROCCO *Email address*: samih.lazaiz@usmba.ac.ma