







### III. KESIMPULAN

Pada Lema 3, baru diperoleh syarat perlu dari  $a^+(a^+)^* = (a^+)^*a^+$  untuk  $a \in R^+$ , dan perlu dibangun syaratukupnya. Dengan memperoleh syarat perlu dan cukup  $a^+(a^+)^* = (a^+)^*a^+$  untuk  $a \in R^+$ , akan dapat dibangun syarat perlu dan cukup  $a \in R^+$  adalah normal, dengan melibatkan Teorema 1.

### DAFTAR PUSTAKA

- [1] J. J. Koliha, D. Djordjević, and D. Cvetković, “Moore-Penrose inverse in rings with involution,” *Linear Algebra Appl.*, vol. 426, no. 2–3, pp. 371–381, 2007, doi: 10.1016/j.laa.2007.05.012.
- [2] D. Mosić and D. S. Djordjević, “Some results on the reverse order law in rings with involution,” *Aequationes Math.*, vol. 83, no. 3, pp. 271–282, 2012, doi: 10.1007/s00010-012-0125-2.
- [3] S. R. R. M. Titi Udjiani, Harjito, Suryoto, and N. Prima P, “Generalized Moore Penrose Inverse of Normal Elements in a Ring with Involution,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 300, no. 1, pp. 1–5, 2018, doi: 10.1088/1757-899X/300/1/012074.
- [4] S. Xu and J. Chen, “The moore-penrose inverse in rings with involution,” *Filomat*, vol. 33, no. 18, pp. 5791–5802, 2019, doi: 10.2298/FIL1918791X.
- [5] R. Zhao, H. Yao, and J. Wei, “Moore-Penrose inverses in rings and weighted partial isometries in  $C^*$ -algebras,” *Appl. Math. Comput.*, vol. 395, no. 2020, p. 125832, 2021, doi: 10.1016/j.amc.2020.125832.
- [6] P. S. Reddy and K. Benebere, “Involution on Rings,” *SSRN Electron. J.*, no. March, 2019, doi: 10.2139/ssrn.3390376.
- [7] O. M. Baksalary and G. Trenkler, “Characterizations of EP, normal, and Hermitian matrices,” *Linear Multilinear Algebr.*, vol. 56, no. 3, pp. 299–304, 2008, doi: 10.1080/03081080600872616.
- [8] W. Chen, “On EP elements, normal elements and partial isometries in rings with involution,” *Electron. J. Linear Algebr.*, vol. 23, no. 174007, pp. 553–561, 2012, doi: 10.13001/1081-3810.1540.
- [9] D. S. Djordjević, “Characterizations of normal, hyponormal and EP operators,” *J. Math. Anal. Appl.*, vol. 329, no. 2, pp. 1181–1190, 2007, doi: 10.1016/j.jmaa.2006.07.008.
- [10] D. Mosić and D. S. Djordjević, “Moore-Penrose-invertible normal and Hermitian elements in rings,” *Linear Algebra Appl.*, vol. 431, no. 5–7, pp. 732–745, 2009, doi: 10.1016/j.laa.2009.03.023.
- [11] Y. Qu, J. Wei, and H. Yao, “Characterizations of normal elements in rings with involution,” *Acta Math. Hungarica*, vol. 156, no. 2, pp. 459–464, 2018, doi: 10.1007/s10474-018-0874-z.
- [12] A. Ben-Israel, “The Moore of the Moore-Penrose inverse,” *Electron. J. Linear Algebr.*, vol. 9, no. August, pp. 150–157, 2002, doi: 10.13001/1081-3810.1083.
- [13] E. Boasso, “Moore-Penrose inverse and doubly commuting elements in  $SC^*$ -algebras,” pp. 35–44, 2013, [Online]. Available: <http://arxiv.org/abs/1309.6911>
- [14] D. Mosić and D. S. Djordjević, “Weighted partial isometries and weighted-EP elements in  $C^*$ -algebras,” *Appl. Math. Comput.*, vol. 265, no. 174007, pp. 17–30, 2015, doi: 10.1016/j.amc.2015.04.102.
- [15] D. Mosić, C. Deng, and H. Ma, “On a weighted core inverse in a ring with involution,” *Commun. Algebr.*, vol. 46, no. 6, pp. 2332–2345, 2018, doi: 10.1080/00927872.2017.1378895.
- [16] T. Udjiani and Suryoto, “Commutative symmetric element in a ring with involution,” *J. Phys. Conf. Ser.*, vol. 1943, no. 1, pp. 1–4, 2021, doi: 10.1088/1742-6596/1943/1/012116.