

## GREEN'S RELATIONS ON SUBMONOIDS OF GENERALIZED HYPERSUBSTITUTIONS OF TYPE $(n)$

PORNPIMOL KUNAMA

*Ph.D.'s Degree Program in Mathematics*  
*Department of Mathematics, Faculty of Science*  
*Chiang Mai University, Chiang Mai 50200, Thailand*  
**e-mail:** pornpimol5331@gmail.com

AND

SORASAK LEERATANAVALLEE<sup>1</sup>

*Research Center in Mathematics and Applied Mathematics*  
*Department of Mathematics, Faculty of Science*  
*Chiang Mai University, Chiang Mai 50200, Thailand*  
**e-mail:** sorasak.l@cmu.ac.th

### Abstract

A generalized hypersubstitution of type  $\tau = (n)$  is a function which takes the  $n$ -ary operation symbol  $f$  to the term of the same type  $\sigma(f)$  which does not necessarily preserve the arity. Let  $Hyp_G(n)$  be the set of all these generalized hypersubstitutions of type  $(n)$ . The set  $Hyp_G(n)$  with a binary operation and the identity generalized hypersubstitution forms a monoid. The objective of this paper is to study Green's relations on the set of all regular elements of  $Hyp_G(n)$ .

**Keywords:** generalized hypersubstitutions, green's relation, regular elements.

**2010 Mathematics Subject Classification:** 20M07, 08B15, 08B25.

### REFERENCES

- [1] K. Denecke and S.L. Wismath, *Hyperidentities and Clones* (Gordon and Breach Science Publishers, The Netherlands, 2000).  
<https://doi.org/10.1201/9781482287516>

---

<sup>1</sup>Corresponding author.

- [2] K. Denecke, D. Lau, R. Pöschel and D. Schweigert, Hyperidentities, Hyperequational Classes, and Clone Congruences, Contributions to General Algebra, Vol. 7 (Verlag Hölder-Pichler-Tempsky, Wien, 1991) 97–118.
- [3] J.M. Howie, Fundamentals of Semigroup Theory (Oxford University Press, New York, NY, USA, 1995).  
<https://doi.org/10.1017/S0013091500023889>
- [4] S. Leeratanavalee and K. Denecke, Generalized Hypersubstitutions and Strongly Solid Varieties, General Algebra and Applications, Proc. of the "59 th Workshop on General Algebra, "15th Conference for Young Algebraists Potsdam 2000" (Shaker Verlag, 2000) 135–145.
- [5] W. Puninagool and S. Leeratanavalee, *Green's relations on  $Hyp_G(2)$* , Analele stiintifice ale Universitatii Ovidius Constanta, Seria Matematica **20** (2012) 249–264.  
<https://doi.org/10.2478/v10309-012-0016-5>
- [6] W. Puninagool and S. Leeratanavalee, *The monoid of generalized hypersubstitutions of type  $\tau = (n)$* , Discuss. Math. Gen. Alg. Appl. **30** (2010) 173–191.  
<https://doi.org/10.7151/dmgaa.1168>
- [7] W. Wongpinit and S. Leeratanavalee, *All maximal idempotent submonoids of  $Hyp_G(n)$* , Surveys in Math. and its Appl. **10** (2015) 41–48.

Received 10 May 2020

Revised 30 July 2020

Accepted 30 July 2020