

UPPER AND LOWER WEAKLY (τ, m) - J -CONTINUOUS MULTIFUNCTIONS

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ABSTRACT. We introduce the notions of upper/lower weakly (τ, m) - J -continuous multifunctions and obtain some characterizations of such multifunctions. These concepts are obtained using different generalizations of the notion of J -open sets on the ideal topological space (Y, σ, J) .

REFERENCES

- [1] M. E. Abd El-Monsef, S. N. El-Deeb and R. A. Mahmoud, *β -open sets and β -continuous mappings*, Bull. Fac. Sci. Assiut Univ. **12** (1983), 77–90.
- [2] M. Akdag, *On upper and lower I -continuous multifunctions*, Far East J. Math. Sci. **25** (2007), 48–57.
- [3] M. Akdag and S. Canan, *Upper and lower semi- I -continuous multifunctions*, J. Adv. Res. Pure Math. **6** (2014), 78–88.
- [4] M. Akdag and F. Erol, *Upper and lower α - I -continuous multifunctions*, Int. Math. Forum **9**(5) (2014), 225–235.
- [5] D. Andrijević, *On b -open sets*, Mat. Vesnik **48** (1996), 59–64.
- [6] A. Caksu Guler and G. Aslim, *b - I -open sets and decompositions of continuity via idealization*, Proc. Inst. Math. Mech. Nat. Acad. Sci. Azerbaijan **22** (2003), 27–32.
- [7] J. Dontchev, *On pre- \mathcal{I} -open sets and a decomposition of \mathcal{I} -continuity*, Banyan Math. J. **2** (1996).
- [8] E. Hatin and S. Jafari, *On weakly semi- I -open sets and other decomposition of continuity via ideals*, Sarajevo J. Math. **14** (2006), 107–114.
- [9] E. Hatin, A. Keskin and T. Noiri, *On a new decomposition of continuity via idealization*, JP J. Geometry Topology **3**(1) (2003), 53–64.
- [10] E. Hatin and T. Noiri, *On decompositions of continuity via idealization*, Acta Math. Hungar. **96**(4) (2002), 341–349.
- [11] E. Hatin and T. Noiri, *On β - I -open sets and a decomposition of almost- I -continuity*, Bull. Malays. Math. Sci. Soc. (2) **29**(1) (2006), 119–124.
- [12] D. Janković and T. R. Hamlett, *New topologies from old via ideals*, Amer. Math. Monthly **97** (1990), 295–310.
- [13] D. Janković and T. R. Hamlett, *Compatible extensions of ideals*, Boll. Un. Mat. Ital. (7) **6-B** (1992), 453–465.
- [14] K. Kuratowski, *Topology*, Vol. I, Academic Press, New York, 1966.
- [15] N. Levine, *A decomposition of continuity in topological spaces*, Amer. Math. Monthly **68** (1961), 44–46.
- [16] N. Levine, *Semi-open sets and semi-continuity in topological spaces*, Amer. Math. Monthly **70** (1963), 36–41.

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- [17] H. Maki, K. C. Rao and A. Nagoor Gani, *On generalizing semi-open and preopen sets*, Pure Appl. Math. Sci. **49** (1999), 17–29.
- [18] A. S. Mashhour, M. E. Abd El-Monsef and S. N. El-Deep, *On precontinuous and weak precontinuous mappings*, Proc. Math. Phys. Soc. Egypt **53** (1982), 47–53.
- [19] J. M. Mustafa, S. Al Ghour and K. Al Zoubi, *Weakly b-I-open sets and weakly b-I-continuous functions*, Ital. J. Pure Appl. Math. N.**30** (2013), 23–32.
- [20] O. Njåstad, *On some classes of nearly open sets*, Pacific J. Math. **15** (1965), 961–970.
- [21] T. Noiri and V. Popa, *On upper and lower M-continuous multifunctions*, Filomat **14** (2000), 73–86.
- [22] T. Noiri and V. Popa, *A unified theory of weak continuity for multifunctions*, Sci. Stud. Res. Ser. Math. Inform. **24**(2) (2014), 95–114.
- [23] T. Noiri and V. Popa, *Some generalizations of ultra continuous multifunctions*, Sci. Stud. Res. Ser. Math. Inform. **26**(2) (2016), 5–30.
- [24] T. Noiri and V. Popa, *A unified form of m-I-continuity in ideal bitopological spaces*, Questions Answers General Topology **41** (2023), 47–61.
- [25] V. Popa, *Weakly continuous multifunctions*, Boll. Un. Mat. Ital. **15 A** (1972), 37–41.
- [26] V. Popa and T. Noiri, *On M-continuous functions*, Anal. Univ. "Dunarea de Jos" Galati, Ser. Mat. Fiz. Mec. Teor., Fasc. (2) **18 (23)** (2000), 31–41.
- [27] V. Popa and T. Noiri, *On the definitions of some generalized forms of continuity under minimal conditions*, Mem. Fac. Sci. Kochi Univ. Ser. Math. **22** (2001), 31–41.
- [28] V. Popa and T. Noiri, *On m-continuous multifunctions*, Sci. Stud. Univ. Pelitehn. Timisoara **63** (2001), 1–12.
- [29] V. Popa and T. Noiri, *On weakly (τ, m) -continuous functions*, Rend Circ. Mat. Palermo (2) **51** (2002), 295–316.
- [30] V. Popa and T. Noiri, *A unified theory of weak continuity for functions*, Rend. Circ. Mat. Palermo (2) **51** (2002), 439–464.
- [31] R. Raja Rajeswari, *On some properties of ultra weakly continuous multifunctions*, Anal. Univ. Vest. Timisoara Ser. Mat. Inform. **49** (2011), 99–105. (= Asian-European J. Math. **4** (2011), 163–169.)
- [32] R. E. Smithson, *Almost and weak continuity for multifunctions*, Bull. Calcutta Math. Soc. **70** (1978), 383–390.
- [33] R. Vaidyanathaswami, *The localization theory in set-topology*, Proc. Indian Acad. Sci. **20** (1945), 51–62.

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