

## Integration in Some New Concept of Ergodic Functions and Application to Some Epidemiological Models.

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**ABSTRACT:** In the paper by Ait Dads et al [2], we introduced a new class of functions, which we call measure pseudo  $\mathcal{S}$  - asymptotically omega periodic functions and give some properties of those functions as the Topological properties of the space of such functions, the invariance by translation of this space and the convolution product in this space. In this paper we consider the same class of functions and give contributions as the stability by the integral operator, we present some examples and composition results. Then we apply the obtained results to investigate the existence of measure pseudo  $\mathcal{S}$  - asymptotically omega periodic mild solutions for some nonlinear infinite delay integral equations arising in epidemiology, exactly, we consider the nonlinear infinite delay integral equation:

$$x(t) = \alpha(t)x(t - \beta) + \int_{-\infty}^t a(t - s)f(s, x(s))ds + g(t, x(t)) \text{ for } t \in \mathbb{R}.$$

Then we apply these results to a finite delay integral equation when the delay is time dependent

$$x(t) = \alpha(t)x(t - \beta) + \int_{t-\gamma(t)}^t f(s, x(s))ds + g(t, x(t)) \text{ for } t \in \mathbb{R}.$$

## References

- [1] E. Ait Dads and L. Lhachimi: New contributions on Asymptotic Periodic functions and  $\mathcal{S}$  - Asymptotically omega periodic functions, *Applicable Analysis* (2022). pp. 1-17.
- [2] E. Ait Dads and L. Lhachimi , New Development Theory on Measure Pseudo  $\mathcal{S}$  - Asymptotically Omega Periodic functions. To appear in *Nonautonomous dynamic Systems Journal*. M.S.D.S-D-21-00038 submitted Oct.,28. 2021 accepted Feb. 17; 2022..