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BEHAVIOR OF TWO AND THREE-DIMENSIONAL SYSTEMS OF DIFFERENCE EQUATIONS IN MODELLING COMPETITIVE POPULATIONS

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Abstract. The main objective of this paper is to determine the closed form solutions of system of non-linear difference equations in the modelling competitive populations

$$x_{n+1} = \frac{x_{n-1}}{a_n + x_{n-1}\ y_n}\ ,\ y_{n+1} = \frac{y_{n-1}}{a_n + y_{n-1}\ x_n}, z_{n+1} = \frac{1}{y_n\ z_n}$$

where $\{a_n\}$ sequence with initial values x_{-1}, x_0, y_{-1}, y_0,and z_0 such that $x_{-1}\ y_0 \neq -a_0$, $x_0\ y_1 \neq -a_1$, $y_{-1}\ x_0 \neq -a_0$, , and $y_0\ x_1 \neq -a_1$. We study some special cases of system (1).In the Final section ,we introduce numerical examples.

Keywords. solutions, difference equation, competitive,convergence,stability

AMS (MOS) subject classification: 39A10,39A11

1 Introduction

Discrete dynamical systems or Difference equations [35] is varied field which manipulate nearly every offshoot of applied and pure mathematics. The s-tudying of properties of systems of difference equations is a subject of interest in last years, see books [[1] ,[11],[17]]. A difference equations system of order one

$$S_{n+1} = \phi(S_n, T_n)\quad ,\quad T_{n+1} = \psi(S_n, T_n) \tag{1}$$

, $n = 0, 1, ...,$ $(S_0, T_0) \in R$, R subset of $\mathbb{R}^2$,$(\phi, \psi) : R \to R$, and ϕ, ψ are mapping is *competitive* if $\phi(s, t)$ is non-decreasing in s and non-increasing in t; and $\psi(s, t)$ is nondecreasing in t and nonincreasing in s [36].

Competitive systems deliberated by plentiful authors (For examples [3], [4], [8],[15], [18], [26],[36] , [37], [38]).

In a modelling framework, competitive system of nonn-linear difference equations

$$s_{n+1} = \frac{s_n}{a + t_n}\ \ \&\ \ t_{n+1} = \frac{t_n}{b + s_n}$$