**Remark 2.1** *For the application of the results, it is possible to take the initial moment as* $t_0 = 0$, *without being the discontinuity moment since of the group property. Then* $x_0 \notin \Gamma \cup \tilde{\Gamma}$.

Denote by $\widehat{[a,b]}$, $a, b \in \mathbb{R}$, the interval $[a,b]$, whenever $a \leq b$ and $[b,a]$, otherwise. Let $x_1(t) \in PC(\mathbb{R}_+, \theta^1)$, $\theta^1 = \{\theta_i^1\}$, and $x_2(t) \in PC(\mathbb{R}_+, \theta^2)$, $\theta^2 = \{\theta_i^2\}$, be two different solutions of (2.1).

**Definition 2.3** *The solution* $x_2(t)$ *is in the* $\epsilon-$*neighborhood of* $x_1(t)$ *on the interval* $\mathscr{I}$ *if*

- *the sets* $\theta^1$ *and* $\theta^2$ *have same number of elements in* $\mathscr{I}$;
- $|\theta_i^1 - \theta_i^2| < \epsilon$ *for all* $\theta_i^1 \in \mathscr{I}$;
- *the inequality* $||x_1(t) - x_2(t)|| < \epsilon$ *is valid for all* $t$, *which satisfy* $t \in \mathscr{I} \setminus \cup_{\theta_i^1 \in \mathscr{I}} (\theta_i^1 - \epsilon, \theta_i^1 + \epsilon)$.

The topology defined with the help of $\epsilon-$ neighborhoods is called the B-topology. It can be apparently seen that it is Hausdorff and it can be considered also if two solutions $x_1(t)$ and $x_2(t)$ are defined on a semi-axis or on the entire real axis.

**Definition 2.4** *The solution* $x_0(t) = x(t, 0, x_0)$, $t \in \mathbb{R}$, $x_0 \in D$, *of (2.1) B-continuously depends on* $x_0$ *for increasing* $t$ *if there corresponds a positive number* $\delta$ *to any positive* $\epsilon$ *and a finite interval* $[0, b]$, $b > 0$ *such that any other solution* $x(t) = x(t, 0, \tilde{x})$ *of (2.1) lies in* $\epsilon-$*neighborhood of* $x_0(t)$ *on* $[0, b]$ *whenever* $\tilde{x} \in B(x_0, \delta)$. *Similarly, the solution* $x_0(t)$ *of (2.1) B-continuously depends on* $x_0$ *for decreasing* $t$ *if there corresponds a positive number* $\delta$ *to any positive* $\epsilon$ *and a finite interval* $[a, 0]$, $a < 0$ *such that any other solution* $x(t) = x(t, 0, \tilde{x})$ *of (2.1) lies in* $\epsilon-$*neighborhood of* $x_0(t)$ *on* $[a, 0]$ *whenever* $\tilde{x} \in B(x_0, \delta)$. *The solution* $x_0(t)$ *of (2.1) B-continuously depends on* $x_0$ *if it continuously depends on the initial value,* $x_0$, *for both increasing and decreasing* $t$.

If conditions (C1)-(C7) hold, then each solution $x_0(t) : \mathbb{R} \to \mathbb{R}^n$, $x_0(t) = x(t, 0, x_0)$, of (2.1) continuously depends on $x_0$ [1].

## 2.1 B-equivalence to a system with fixed moments of impulses

In order to facilitate the analysis of the system with variable moments of impulses (2.1), a *B-equivalent system* [1] to the system with variable moments of impulses will be utilized in our study. Below, we will construct the B-equivalent system.

Let $x(t) = x(t, 0, x_0 + \Delta x)$ be a solution of system (2.1) neighbor to $x_0(t)$ with small $\|\Delta x\|$. If the point $x_0(\theta_i)$ is a $(\beta)-$ or $(\gamma)-$ type point, then it is a boundary point. For this reason, there exist two different possibilities for the near solution $x(t)$ with respect to the surface of discontinuity. They are:

$(N1)$ The solution $x(t)$ intersects the surface of discontinuity, $\Gamma$, at a moment near to $\theta_i$,

$(N2)$ The solution $x(t)$ does not intersect $\Gamma$, in a small time interval centered at $\theta_i$.