*Proof of Lemma 5:* Let $Q_n(q_0, \Delta) = \{q$: for some $\sigma \in L(\Delta, \mathbb{S})$ such that $|\sigma| = n$, $q = \delta(q_0, \sigma)\}$. Then, we prove that $\forall n \in \aleph$, $Q_n(q_0, \Delta_L) \subseteq Q_n(q_0, \Delta_J)$ by mathematical induction on the length of the event string $|\sigma|$ as follows.

If $|\sigma| = n = 0$, it is clear that $Q_0(q_0, \Delta_L) = Q_0(q_0, \Delta_J) = \{q_0\}$. Thus, $Q_n(q_0, \Delta_L) \subseteq Q_n(q_0, \Delta_J)$ when $n = 0$.

Suppose that $Q_n(q_0, \Delta_L) \subseteq Q_n(q_0, \Delta_J)$ when $|\sigma| = n > 0$. Now, we prove $Q_{n+1}(q_0, \Delta_L) \subseteq Q_{n+1}(q_0, \Delta_J)$. Suppose that $\exists q \in Q_n(q_0, \Delta_L) \cap Q_n(q_0, \Delta_J)$ and $\pi \in \xi(q)$ that $q_1 = \delta(q, \pi) \in Q_{n+1}(q_0, \Delta_L)$ but $q_1 \notin Q_{n+1}(q_0, \Delta_J)$. In other words, $q_1$ satisfies inequalities in RO, $\mathcal{D}$, and NHC$_2$ but violates $\varsigma$. Let $M = \Upsilon(\chi(q_1))$ and $M' = \Upsilon(\chi(q))$. We consider two cases of $\pi \in \sum_c \cup \sum_u$.

Case 1) $\pi = \alpha_{jk} \in \sum_c$. Since $q_1$ satisfies NHC$_2$, $M(\varphi(r_m)) + M(\varphi(r_n)) < C(r_m) + C(r_n)$, $\forall r_m, r_n \in R_F$. Since $q_1$ satisfies $\mathcal{D}$, $M(\varphi(r_m)) \le C(r_m)$, i.e., $M(r_m) \ge 0$, $\forall r_m \in R_F$. Suppose that $N_f$ does not contain ξ-resources. Since $q$ satisfies $\varsigma$ and $q_1$ violates $\varsigma$, $t_{jk}$ (corresponding to $\alpha_{jk}$) is not resource-enabled at $M'$ in $N_f$ ($t_{jk}$ is process-enabled since $\alpha_{jk} \in \xi(q)$) or there is a saturated MPRT-circuit $\theta$ at $M$ in $N_f$. If $t_{jk}$ is not resource-enabled at $M'$, then $M(r_m) < 0$, where $r_m = R(p_{jk}, N_f) \in R_F$. It is a contradiction to the assumption that $q_1$ satisfies $\mathcal{D}$. Thus, there is a saturated MPRT-circuit $\theta$ at $M$ in $N_f$. That means $M(\varphi(r_m)) = C(r_m)$, $\forall r_m \in \Re[\theta]$. Since $\Re[\theta] \subseteq R_F$ and $|\Re[\theta]| \ge 2$, it is a contradiction to the assumption that $q_1$ satisfies NHC$_2$.

Suppose that $(N_f, M_{f0})$, $(N_f(r_1), M_{fA1})$, ..., and $(N_f(r_1, ..., r_{(z-1)}), M_{fA(z-1)})$ contain ξ-resources but $(N_f(r_1, ..., r_z), M_{fAz})$ does not. Let $M_1 = Y(M')$, $M_2 = Y(M_1)$, …, and $M_z = Y(M_{(z-1)})$ denote the markings of $N_f(r_1)$, $N_f(r_1, r_2)$, ..., and $N_f(r_1, ..., r_z)$ corresponding to $M'$, respectively. Since $q$ satisfies $\varsigma$ and $q_1$ violates $\varsigma$, $t_{jk}$ is not resource-enabled ($t_{jk}$ is process-enabled since $\alpha_{jk} \in \xi(q)$) at $M_v$ in $N_f(r_1, ..., r_v)$, where $v \in \{1, 2, …, z\}$ or there is a saturated MPRT-circuit $\theta$ at $M_{1z}$ in $N_f(r_1, ..., r_z)$, where $M_z[t_{jk} > M_{1z}$.

Let $M_{11} = Y(M)$, $M_{12} = Y(M_{11})$, …, and $M_{1z} = Y(M_{1(z-1)})$ denote the markings of $N_f(r_1)$, $N_f(r_1, r_2)$, ..., and $N_f(r_1, ..., r_z)$ corresponding to $M$, respectively. If $t_{jk}$ is not resource-enabled at $M_v$, then there is a resource $r_w$ ($w \ne 1, …, v$) in $N_f(r_1, ..., r_v)$ that $M_{1v}(r_w) < 0$. Then, there is at least one part in $p \in H(r_w, N_f(r_1, ..., r_v))$ at $M_{1v}$ and $R(p, N_f) = r_m \in \{r_1, …, r_v\}$ (if there is no such part, then $M_{1v}(r_w) = M(r_w) \ge 0$.). Since $r_1, …, r_v$ are ξ-resources, $C(r_n) = 1$, $\forall r_n \in \{r_1, …, r_v\}$. Thus, only one such part participates in this violation (if two or more such parts participate in this violation then $q_1$ violates NHC$_2$.). Since $M_{1v}(r_w) < 0$, $M(r_w) = M_{1v}(r_w) + 1 \le 0$. Since $M(r_w) \ge 0$, $M(r_w) = 0$, i.e., $M(\varphi(r_w)) = C(r_w)$. Since there is another resource $r_m \in \{r_1, …, r_v\}$ and $r_m \ne r_w$ that $M(\varphi(r_m)) = C(r_m) = 1$, it is a contradiction to the assumption that $q_1$ satisfies NHC$_2$.

Thus there is a saturated MPRT-circuit $\theta$ at $M_{1z}$ in $N_f(r_1, ..., r_z)$. Then, $M_{1z}(r_m) = 0$, $\forall r_m \in \Re[\theta]$. Suppose that there is not a part in $p \in H(r_m, N_f(r_1, ..., r_z))$ at $M_{1z}$, where $r_m \in \Re[\theta]$, and $R(p, N_f) = r_t \in \{r_1, …, r_z\}$. Then $\forall r_m \in \Re[\theta]$, $M(r_m) = M_{1z}(r_m) = 0$, i.e., $M(\varphi(r_m)) = C(r_m)$. This is a contradiction to the assumption that $q_1$ satisfies NHC$_2$. Since $r_1, …, r_z$ are ξ-resources, $C(r_t) = 1$, $\forall r_t \in \{r_1, …, r_z\}$. Thus, only one such part participates in this saturation (if two or more such parts participate in this saturation then $q_1$ violates NHC$_2$.). Suppose that this part is in $p \in H(r_w, N_f(r_1, ..., r_z))$ at $M_{1z}$, where $r_w \in \Re[\theta]$, and $R(p, N_f) = r_s \in \{r_1, …, r_z\}$. Then, $\forall r_m \in \Re[\theta] \backslash \{r_w\}$, $M(r_m) = M_{1z}(r_m) = 0$, i.e., $M(\varphi(r_m)) = C(r_m)$, and $M(\varphi(r_s)) = C(r_s) = 1$. Since $|\Re[\theta]| \ge 2$ and $r_s \notin \Re[\theta]$, it is a contradiction to the assumption that $q_1$ satisfies NHC$_2$.

Case 2) $\pi \in \sum_u$. If $\pi = \beta_{jk}$, $\kappa$ or $\eta$, $M' = M$. Since $M'$ is accepted by $\varsigma$, $M$ is accepted by $\varsigma$, too. It is a contradiction to the assumption that $q_1$ violates $\varsigma$.

Thus, $Q_{n+1}(q_0, \Delta_L) \subseteq Q_{n+1}(q_0, \Delta_J)$. So, $\forall n \in \aleph$, $Q_n(q_0, \Delta_L) \subseteq Q_n(q_0, \Delta_J)$. Since $Q_R(q_0, \Delta) = \{q$: for some $\sigma \in L(\Delta, \mathbb{S})$, $q = \delta(q_0, \sigma)\} = \cup_{n \in \aleph} Q_n(q_0, \Delta)$, $Q_R(q_0, \Delta_L) \subseteq Q_R(q_0, \Delta_J)$. ■