CHAPTER 4

CONCLUSION

In this work, we gave sufficient conditions for asymptotic stability of the equilibrium $x = 0$ of (1.1) and (1.2), by using the Lyapunov Theory.

The following main results we obtained.

1. Neutral system.

Theorem 3.1.1 The equilibrium $x = 0$ of (1.1) is asymptotic stability if there exist positive definite matrices P , G_1 and G_2 such that for any positive constants α, β with $\alpha + \beta = 1$, the following matrices

$$\begin{aligned} F_1 &= A^TP + PA + G_1 + G_2 + \frac{1}{\alpha}K^TG_1^{-1}K + M^TG_2^{-1}M + 3\delta\alpha_0^2I + \delta^{-1}P^2 + 3\gamma\alpha_0^2I, \\ F_2 &= 3\delta\alpha_1^2I + 3\gamma\alpha_1^2I + \gamma^{-1}C^TP^2C, and \\ F_3 &= 3\delta\alpha_2^2I + 3\gamma\alpha_2^2I + \frac{1}{\beta}H^TG_1^{-1}H \end{aligned}$$

are negative definite, where $I = n \times n$ identity matrix, $K = C^TPA$, $M = B^TP$, $H = B^TPC$ and $f = f(t, x(t), x[t-\tau], x[t-\sigma])$.

2. The Hopfiled neural network.

Theorem 3.2.1 The equilibrium $x = 0$ of (1.2) is asymptotic stability if there exist positive definite matrices P , G_1 and G_2 such that for any positive constants α, β with $\alpha + \beta = 1$, the following matrices

$$\begin{aligned} F_4 &= A^TP + PA + G_1 + G_2 + \frac{1}{\alpha}K^TG_1^{-1}K + W^TG_2^{-1}W + 3\delta\alpha_0^2I + \delta^{-1}P^2 + 3\gamma\alpha_0^2I, \\ F_5 &= 3\delta\alpha_1^2I + 3\gamma\alpha_1^2I + \gamma^{-1}C^TPPC, and \\ F_6 &= 3\delta\alpha_2^2I + 3\gamma\alpha_2^2I + \frac{1}{\beta}Z^TG_1^{-1}Z \end{aligned}$$

are negative definite, where $I = n \times n$ identity matrix, $K = C^TPA$, $W = PBT(x[t-\sigma])$, $Z = T(x[t-\sigma])B^TPC$ and $f = f(t, x(t), x[t-\tau], x[t-\sigma])$.