# **EEE575**

ASSIGNMENT 1

## Q1: Read the paper and write a summary

**A Brief History of Automatic Control**

In his paper *A Brief History of Automatic Control*, Stuart Bennett discusses the evolution of automatic control and divides it into four major periods: Early Control (before 1900), the Pre-Classical Period (1900–1940), the Classical Period (1935–1960), and Modern Control (after 1955).

During the Early Control stage, control technology was generally based on practical devices derived from direct observation and physical phenomena. Ancient water clocks, early temperature regulators, and Watt’s centrifugal governor—although often lacking rigorous theoretical foundations—represented the initial attempts at process control. The works of Maxwell, Routh, and Hurwitz marked a turning point by providing the first mathematical tools for stability analysis and laying the foundation for control theory.

In the Pre-Classical Period, feedback control quickly expanded into engineering applications such as boiler regulation, ship steering, and electrical systems. However, most designs still relied heavily on empirical knowledge and lacked a systematic framework. With Minsky’s formulation of the PID control law, Black’s invention of the negative feedback amplifier, and Nyquist’s frequency-domain analysis, control science began to transform from an empirical practice into a mathematically grounded discipline.

The Classical Period was characterized by the emergence and development of frequency-response and time-domain methods. Tools such as the Bode plot, Nyquist criterion, Nichol’s chart, and the Ziegler–Nichols tuning rules were discovered and widely applied. During World War II, wartime demands—including antiaircraft gun aiming—accelerated the development of servomechanisms, radar tracking, and integrated systems. Importantly, this period established control engineering as an independent discipline supported by various institutions.

Finally, Modern Control Theory emerged in the late 1950s, driven by two key factors: the demands and challenges in aerospace and missile guidance, and the rise of digital computers. The state-space approach pioneered by Kalman introduced new concepts such as controllability, observability, and optimal control, fundamentally reshaping the discipline.

In this paper, I learned that the development of automatic control was not achieved overnight. What’s more, it progressed through continuous modification and practical application, later summarized and refined through mathematical theory. Early control devices mainly relied on empirical design and physical phenomena. However, the contributions of Watt, Maxwell, and Routh gradually transformed control into a discipline with a rigorous mathematical foundation. In the 20th century, Black, Nyquist, and Bode established frequency-domain methods as new and highly efficient tools. With the ongoing advancement of control science, it is expected to shoulder increasing social responsibilities in the future.

## Q2: For the two circuits shown below

## Q3: Find the transfer function for the block diagram below

图示

AI 生成的内容可能不正确。