5.7 – Chebyshev Multi-section Matching Transformer

Reading Assignment: ***pp. 250-255***

We can also build a multisection matching network such that the function $\Gamma(f)$ is a **Chebyshev** function.

Chebyshev functions **maximize bandwidth**, albeit at the cost of **pass-band ripple**.

HO: The Chebyshev Multi-section Matching Transformer

The Chebyshev Matching Transformer

An **alternative** to Binomial (Maximally Flat) functions (and there are **many** such alternatives!) are **Chebyshev** polynomials.

Pafnuty Chebyshev

1821 -1894

Chebyshev solutions can provide functions $\Gamma(\omega)$ with **wider bandwidth** than the Binomial case—albeit at the "expense" of **passband ripple**.

It is evident from the plot below that the Chebychev response is **far** from maximally **flat**! Instead, a Chebyshev matching network exhibits a "**ripple**" in its passband. Note the magnitude of this ripple never exceeds some **maximum** value Γ_m (within the **pass-band**).

The two frequencies at which the value $|\Gamma(\omega)|$ **does** increase beyond Γ_m define the **bandwidth** of the matching network. We denote these frequencies $\omega_m = 2\pi f_m$ (the plot above shows the locations of the frequencies for ***N*** =**4**).

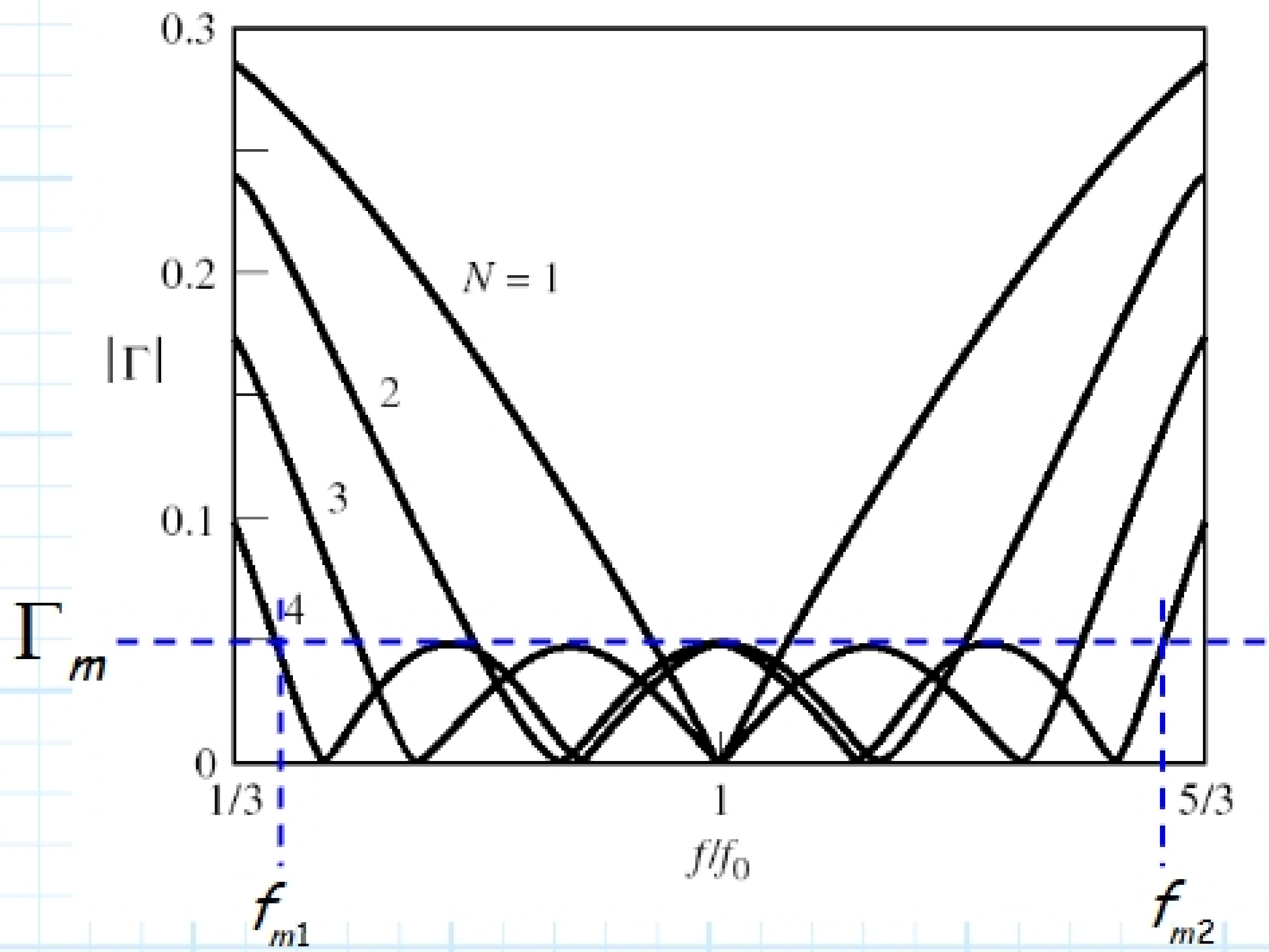

Figure 5.17 (p. 255)
Reflection coefficient magnitude versus frequency for the Chebyshev multisection matching transformers of Example 5.7.

→ Note that the **bandwidth** defined by f_m **increases** as the **number of sections** N is increased.

→ Note also that the reflection coefficient in **not necessarily zero** at the design frequency f_0 !!!

Instead, we find:

$$|\Gamma(f = f_0)| = \begin{cases} 0 \text{ for odd-valued } N \\ \Gamma_m \text{ for even-valued } N \end{cases}$$